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## SYMPATHETIC INNERVATION OF THE HEART IN MAN

### Preliminary Observations of the Effect of Thoracic Sympathectomy on Heart Rate


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Control of the heart rate in man has long been sought. Slowing of the rapid heart rate has been attempted by several methods, the common one being the use of body rest and drugs. However, these methods have often failed the physician, and so the search continues for better ways to control the human heart rate.

In 1863 von Bezold[1] clarified especially the control of the heart rate by the vagus nerve. Hunt[2] observed in 1899 that the loss of vagus tone caused an acceleration of heart rate by shortening the diastolic period. It was the conclusion of Krogh and Lindhard[3] in 1913 that the initial acceleration of the pulse in voluntary movement is the result of an outflow of impulses from the cortical motor centers of the vagus. This was distinct from the stimulation of the accelerator nerves via the sympathetic that caused a shortening of systole as well as diastole.

Although Langley[4] in 1892 demonstrated that accelerator impulses to the heart leave the cord by the upper five pairs of anterior roots and their white rami, he erroneously concluded that all such impulses had to travel through the cervical cardiac nerves to reach the heart.

Physiologists did an enormous amount of work on the factors controlling the heart rate, but it was not until 1926 that Cannon and Linton and associates[5] demonstrated in animals that accessory cardiac accelerator fibers are carried to the heart in the twigs of the thoracic sympathetic nerves that lie below the eighth cervical and first dorsal ganglions or stellate ganglion. This important anatomic discovery was soon verified by Braeucker in Germany.[6] Ionesco, Enachescu and Teitel[7] stimulated the nerves from the second through the fifth thoracic sympathetic ganglions and observed acceleration of the heart rate. They also showed, contrary to the previous assumption, that removal of the stellate ganglions alone does not deprive the heart of its accelerators. In 1930 Kuntz and Morehouse[8] in this country showed clearly that cardioaccelerator nerves direct to the human heart come from the second, third, fourth and fifth thoracic ganglions of the sympathetic nervous system. These observations have recently been repeated by Saccomanno, Utterback and Klemme[9] in dogs.

Until now there has been no adequate description of the effects on the human heart rate resulting from the operative removal of these thoracic sympathetic nerves (second to fifth dorsal). This closure of the gap between physiologic indications and application in practice has been dependent on the development of surgical technics of intrathoracic surgery that has come largely in the past decade.

As early as 1932 Leriche and Fontaine[10] mentioned ablation of the cervical-thoracic sympathetic chain but denied experience with this operation. In the discussion they mentioned that this operation had been suggested earlier by Franck but was considered dangerous by Danielopolu as it would sacrifice the vasomotor nerves and cardiac accelerators. Indeed, as recently as 1941 White[11] remarked that by total sympathectomy "the heart would undoubtedly be greatly crippled." However, in 1936, Brouha, Cannon and Dill[12] had shown that totally sympathectomized dogs run, jump, play and look like normal dogs and yet after exercise their pulse rates are 30 to 40 per cent below those of normal dogs. By 1938 Smithwick[13] had done a total sympathectomy on a hypertensive man without ill effects and noted that bradycardia was present. In 1944 Grimson,[14] in reporting bilateral sympathectomy on human beings, mentioned no ill effects on cardiac function. Adson and Brown[15] reported that they had not observed any diminution of pulse accel-


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eration after effort when the first two or three thoracic ganglions had been severed.

The idea leading to our present observations came from patients who had thoracic sympathetic nerves severed and later noted that their pulse rate was slower and that exercise did not cause as great an increase in heart rate as before operation.

## CLINICAL MATERIAL

### GROUP I

The first group consists of 7 patients, none of whom had heart disease or during our observation were given drugs such as digitalis. In the first 2 with Raynaud's syndrome, precordial pain and tachycardia, the removal of the thoracic sympathetic ganglions from the second to the fifth dorsal, first on the left side and later the right side, was done. The decrease in pulse rate was most notable after the second or right side had been operated on. These 2 cases support the anatomic and physiologic observations that cardioaccelerator fibers are contained chiefly in the second through the fifth thoracic sympathetic ganglions.

However, in the third case, that of a girl aged 15 with hyperhidrosis, only the second and third dorsal ganglions were decentralized, and yet a decided diminution in pulse rate was observed by the patient and our step tests indicated a diminished acceleration to exercise. The fourth patient, a woman of 56 with Raynaud's disease, had a similar operation (the second and third dorsal ganglions removed from both sides) and yet like others experienced little or no change in the pulse rate.

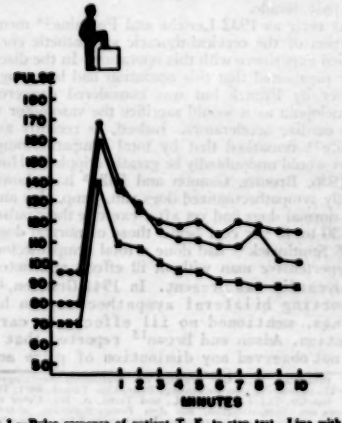


Chart 1.—Pulse response of patient T. E. to step test. Line with solid circles, response before thoracic sympathectomy. Line with open circles, response two months after left sympathectomy (second through fifth dorsal ganglion). Line with crosses, response two months and twenty months after right sympathectomy (second through fifth dorsal ganglions).

The last 3 patients had what we term "sympathetic syndromes"—headache, precordial pain, tachycardia and hyperhidrosis, and had long been suspected to have heart disease and hyperthyroidism, although we could find no evidence of these disorders. The upper five thoracic ganglions were disconnected on the left side of these 3 patients, and all experienced a relief of pain and 2 had relief of tachycardia, both symptomatically and by test.

Case 1.—T. E., a butcher aged 34 years, had Raynaud's syndrome, headaches, slight hypertension and rapid heart action. June 8, 1944, he had a left thoracic sympathectomy (the second, third, fourth and fifth dorsal ganglions), and after this had clinical improvement and less pulse acceleration to the exercise test. March 1, 1945, he had a right thoracic sympathectomy (second, third, fourth and fifth dorsal ganglions). The subsequent course showed the patient asymptomatic and a normal pulse response to the exercise test.

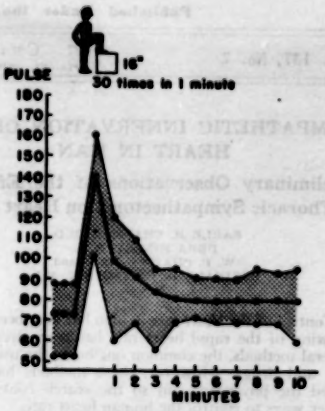


Chart 2.—Normal response to step test.

This patient entered the Baker Memorial Hospital in June 1944, complaining of cold hands and feet for as long as he could remember. In addition, he had known of a high blood pressure and a rapid heart action for several years. An intravenous pyelogram in 1942 was normal. Headaches had troubled him for years. He appeared healthy; the hands were cold and pale; the heart was regular and rapid, and both low and high-pitched systolic murmurs were heard at the apex. The blood pressure was 160 systolic and 88 diastolic. A roentgenogram showed the heart to be normal in size and configuration. The electrocardiogram showed regular rhythm, P waves and P-R interval normal, QRS complexes normal; the T waves were upright 3 mm. in lead 1, 4 mm. in lead 2 and 9 mm. in lead 4.

In the hospital a 16 inch (41 cm.) exercise test was done showing a rapid heart rate that returned to only 116 in ten minutes.

June 8, 1944, a left thoracic sympathectomy was done to relieve his cold hand and to see whether this procedure would slow the pulse or prevent it from accelerating in response to exercise. At operation the second and third sympathetic ganglions were decentralized and encased in a silk cylinder. The fourth and fifth ganglions were removed through the resected fifth rib. Also the second and third intercostal nerves were resected, dividing the roots proximal to the posterior root ganglions.

By June 14 the pulse rate was slower and observers were surprised by the disappearance of his murmurs. His recovery was uneventful, and he left the hospital June 15. August 4 exercise tests showed less acceleration and a decrease to a rate of 100 after ten minutes.

Feb. 26, 1945, he returned to the hospital saying that the left hand had been warm and dry since operation; the right hand still pained on exposure to cold. He was still troubled with palpitation and occasional throbbing headaches, although the latter were less severe since the operation. The examination now showed a slower heart, blood pressure of 150 systolic and 84 diastolic, and a high-pitched systolic murmur could be heard only on inspiration at the left lower sternal border. Because of these symptoms a similar operation was done March 1, and the right second, third, fourth and fifth sympathetic ganglions were disconnected. Recovery was uneventful. On May 18 he reported that he was feeling fine, and the exercise test showed a rise of the pulse rate to 120 and rapid fall to 80. He continued well and

on March 16, 1946, a cold postural test of blood pressure was done. His average lying blood pressure was 151 systolic and 66 diastolic and average standing pressure was 147 systolic and 88 diastolic. On cold stimulation he was a normal reactor. The pulse rate averaged 60. He no longer noted headaches, palpitation or cold hands.

May 8, 1946, and Nov. 27, 1946, he was again examined and found fit. He had no complaints, and his resting pulse rate was 60 and blood pressure was 145 systolic and 82 diastolic. His basal metabolic rate was minus 9.

Case 2.—A. M., a nurse aged 41, had attacks of precordial pain, tachycardia and dyspnea. On May 21, 1946, a left thoracic sympathectomy was done (second to fifth dorsal ganglions) followed by decrease in pulse rate and freedom from pain. A right thoracic sympathectomy (second to fifth dorsal ganglions) was done Feb. 3, 1947, and immediately after operation her pulse rate was 48. Her convalescence was uneventful, and two months later the step tests showed a pronounced decrease in pulse acceleration to exercise; she stood the exercise well.

Case 3.—A. P., a school girl, aged 15, had hyperhidrosis. In February 1944, in a bilateral thoracic sympathectomy the second and third ganglions were resected. Her hands have remained dry and warm. The resting pulse rate is slower, and there is less acceleration of rate during exertion.

Case 4.—G. J., a woman aged 56, had Raynaud's syndrome since 1923. March 7, 1947, the right second and third thoracic sympathetic ganglions were resected; March 19 similar ganglions on the left were removed. Recovery was uneventful, and yet her pulse response to the exercise test was the same before and after operation.

Case 5.—H. H., a woman aged 33, had precordial pain, tachycardia, pains in the left arm and hyperhidrosis. She was suspected to have heart disease. Sept. 21, 1945, the thoracic ganglions 1 through 6 were removed. The patient experienced pronounced relief of symptoms and gained 18 pounds (8.2 Kg.). The pulse rate was slower and there was less acceleration to exercise. The symptoms returned in the spring of 1947, and vasomotor tests indicated regeneration of the sympathetic fibers.

Case 6.—K. L., a woman aged 31, had precordial pain, hyperhidrosis, tachycardia and pounding headaches for three years. There was no proof of heart disease. Operations on the breast did not afford relief. July 3, 1945, a left thoracic sympathectomy (second to fifth dorsal ganglions) was done, followed by relief of symptoms and a slower pulse rate. Pain returned in the left costal margin area in the spring of 1947.

Case 7.—C. G., a housewife aged 37, had precordial pain and tachycardia of nine years duration. Jan. 29, 1946, a left transthoracic sympathectomy was done (second to sixth dorsal ganglions inclusive). Subsequently there was relief from pain but slight decrease in pulse rate.

GROUP II

**The second group consists of 2 patients who had angina pectoris, 1 also having paroxysmal tachycardia. Both showed a pronounced slowing of the heart rate after both left and right dorsal sympathetic ganglions had been removed. However, in both there was little if any change in the heart rate after the first operation or** removal of the first to the sixth dorsal ganglion on the right side and the first to the ninth on the left side.

Case 8.—V. R., a man aged 30 years, had rheumatic heart disease, aortic regurgitation, paroxysmal tachycardia and angina pectoris. Cardiac denervation was done by transthoracic maneuver. On March 14, 1947 a left transthoracic sympathectomy was done from the first through the sixth dorsal ganglion, inclusive (Horner's syndrome). A right transthoracic sympathectomy was done on April 8, 1947 from the first through the sixth dorsal ganglion inclusive (no Horner's syndrome). The operation was followed by pronounced slowing of the pulse rate. No paroxysmal attacks of tachycardia have occurred following the operation (five months' follow-up). Angina pectoris is less frequent but not entirely relieved.

Case 9.—M. F., a woman aged 42 years, had angina pectoris, hyper-reactive blood pressure and sinoauricular tachycardia. On Aug. 15, 1946 a left transthoracic sympathectomy was performed from the first through the eighth dorsal ganglion. The top few centimeters of the great splanchnic nerve were removed. A right transthoracic sympathectomy was done on Sept. 4, 1946 from the first through the ninth dorsal ganglion (bilateral Horner's syndrome). There was definite relief of symptoms with slowing of pulse rate and less acceleration to exercise. The patient has experienced no attacks of angina since the operation, although her electrocardiogram remains abnormal.

GROUP III

The third group consists of 4 hypertensive patients who had splanchnic denervations prior to having cardiac denervations. Two of these had Peet operations (the ninth through the twelfth dorsal ganglion) several years before cardiac denervation; 1 of these then had right dorsal sympathectomy (the first through the tenth dorsal ganglion), and two weeks later the left side was done. The other had the left side done first and then the right. Both showed a lowering of the resting pulse rate and a diminished response to the exercise test[16] that was established chiefly after both sides had been operated on.

Case 10.—A. S., a woman aged 44 years had a sympathectomy (Peet maneuver) five years before admission. She had hypertension, type 2[17] with a test range of 197 to 230 systolic and 128 to 160 diastolic. Her heart showed left ventricular enlargement by roentgen rays. Her fundi were grade 2.[17] On April 3, 1947 a right transthoracic sympathectomy was performed from the first through the tenth dorsal ganglion (no Horner's syndrome). A left transthoracic sympathectomy was done on April 18, 1947 from the first to the tenth dorsal ganglion inclusive. This extended down to dural clips of the previous procedure (left Horner's syndrome). There was pronounced decrease in pulse rate and decreased pulse rate response following operation. Immediate relief of angina and headaches were noted, and there was some immediate lowering of blood pressure. Further follow-up will be necessary for evaluation of the latter.

Case 11.—C. C., a man aged 26 years, had had hypertension since the age of 15 years. On physical examination the heart was normal and the fundi were normal. The electrocardiogram was within normal range, renal function normal and blood pressure type 2. On June 9, 1943 a right lumbodorsal splanchnicectomy was performed from the ninth through the twelfth dorsal ganglion. A left lumbodorsal splanchnicectomy was done on June 22, 1943 from the ninth through the twelfth dorsal ganglion. At entry in the hospital in April, 1947, his blood pressure was type 1, as indicated by postural and cold test with test range 134 systolic and 106 diastolic to 176 systolic and 150 diastolic. The fundi showed grade 2 changes. The electrocardiogram was normal. The renal function and heart function were normal. On April 23, 1947 a left transthoracic sympathectomy was performed from the second to the seventh dorsal ganglion. A right transthoracic sympathectomy was done on May 2, 1947 from the first to the eighth dorsal ganglion. There was definite slowing of heart rate and definitely decreased response to exercise immediately following operation.

The other 2 patients in this group had more extensive previous lumbodorsal sympathectomies. One then had the first through the sixth dorsal ganglion removed on the right followed by removal of the first through the seventh on the left; the other had the first through the seventh removed first on the left and later on the right side. Both showed a pronounced decrease in the resting heart rate and a pronounced diminution in acceleration to the exercise test after the second operation.

Case 12.—H. R., a man aged 41 years, had hypertension of seven years duration. In March 1944, blood pressure was decidedly elevated (postural and cold test gave test range 232 systolic and 154 diastolic to 174 systolic and 114 diastolic type 2

16. Unlike group I the patients in groups II, III and IV were judged unable to perform a test as vigorous as the step test. Hence in these latter groups the "two step exercise test" of Master was used. (Master, A. M.; Nuzie, S.; Brown, R. C., and Parbey, R. C.: The Electrocardiogram and the "Two-Step" Exercise, Am. J. M. Sc. 207:433 [April] 1944).

17. Smithwick, R. H.: Surgical Treatment of Hypertension: The Effect of Radical (Lumbodorsal) Splanchnicectomy on the Hypertensive State of One Hundred and Fifty-six Patients Followed One to Five Years, Arch. Surg. 49:180 (Sept.) 1944.

pressure). Fundi showed grade 3 changes. An electrocardiogram showed inverted T waves in leads 1 and CF5 and low T2. Renal function and heart function were normal. Right lumbodorsal splanchnicectomy was done on March 7, 1944 from the eighth dorsal through the second lumbar ganglion inclusive. On March 29, 1944, a left lumbodorsal splanchnicectomy was done from the eighth dorsal through the first lumbar ganglion inclusive. After this operation the patient had good symptomatic improvement. The electrocardiogram returned to normal, and there was a fairly good blood pressure response until about four months before the last admission, at which time the blood pressure became greatly increased again and the patient became heart conscious with tightness in substernal area and palpitation. Electrocardiographic changes were consistent with hypertensive heart **disease and similar to those noted prior to lumbodorsal splanchnicectomy. On March 8, 1947, a right transthoracic sympathectomy was done from the first through the sixth dorsal ganglion inclusive. On March 21, 1947 a left transthoracic sympathectomy was performed from the first through the seventh** dorsal ganglion inclusive (bilateral Horner's syndrome) There was a definite decrease in pulse rate following bilateral transthoracic sympathectomy with decreased response to exercise but practically no change after the first operation or the right transthoracic sympathectomy was done. There was a reversal of the electrocardiogram to normal immediately after transthoracic sympathectomy with disappearance of heart consciousness. Five months after transthoracic sympathectomy, basal pulse rates and pulse rate response remained about the same as immediately after the operation. The blood pressure had returned to levels similar to those previous to operation and likewise the electrocardiogram had become abnormal as previously noted. At this time, the patient was placed on a modified rice diet with excellent response. Not only was the blood pressure greatly reduced, but the electrocardiogram reverted toward normal once again.

Case 13.—V. T., a woman aged 48 years, had long-standing hypertension. In 1941 she had a coronary thrombosis. In 1945 a lumbodorsal splanchnicectomy was performed; left, the eighth dorsal through the second lumbar ganglion; right, the seventh dorsal through the first lumbar ganglion. After lumbodorsal splanchnic**ectomy, she felt much better in some respects, but palpitation and tachycardia became a major problem. The latter was associated with angia. Palpitation and rapid heart rate were considerably more pronounced than are usually noted after lum**bodorsal splanchnicectomy. The patient was readmitted to the hospital because of these complaints. On physical examination the patient looked well; the heart showed no change except tachycardia. The electrocardiogram showed changes consistent with coronary heart disease. Renal function was normal. The fundi showed grade 1 changes. On Jan. 17, 1947 a left transthoracic sympathectomy was done from the first through the seventh dorsal ganglion. On Feb. 4, 1947 a right transthoracic sympathectomy was done from the first through the seventh dorsal ganglion (bilateral Horner's syndrome). There was considerable slowing of heart rate following left thoracic and pronounced slowing following the bilateral procedure. The patient has been entirely relieved of tachycardia, but she continues to have symptoms brought about by postoperative hypotension as well as some pain in the chest.

GROUP IV

The fourth group consists of 6 patients with hypertension who had a total thoracic sympathectomy. Four of these 6 were operated on for relief of their angina pectoris as well as to lower their blood pressure. The other 2 were operated on in hope of relieving them of their persistent sinus tachycardia as well as to lower their blood pressure. In all 6 after bilateral thoracic sympathectomy there was a definite decrease in the resting heart rate and a diminished heart rate response to the exercise test.

Case 14.—B. P., a man aged 56 years, had had known hypertension since 1942. Symptoms began six months before admission, the outstanding being substernal oppression and discomfort along the left sternal border which was brought on by exercise, eating and emotional stimulation and which was relieved by rest and glyceryl trinitrate. On physical examination the heart was normal. Blood pressure was type 2 (postural and cold test range being 158 systolic and 106 diastolic to 222 systolic and 170 diastolic). Renal function was normal. The fundi were grade 1. The electrocardiogram showed changes characteristic of hypertensive heart disease. A left transthoracic sympathectomy was performed on Oct. 7, 1946 from the first through the eleventh dorsal ganglion. The great splanchnic nerve was removed from its origin down to the diaphragm. On Oct. 22, 1946 a right transthoracic sympathectomy was performed from the first through the twelfth dorsal ganglion. The great splanchnic nerve was removed from its origin to the celiac ganglion. Horner's syndrome developed only on the right. There was moderate lowering of pulse rate and decidedly decreased response to exercise. Angina was completely relieved immediately after the operation, and the electrocardiogram returned toward normal, although it was not entirely normal three months after the operation. One year after the operation, the basal pulse rate was definitely decreased with decreased pulse rate response. The angina was entirely relieved, with a normal electrocardiogram.

Case 15.—H. L., a man aged 53 years, was known to have had elevated blood pressure for twenty-five years. In 1945 angina pectoris developed which became progressively worse, and he had an occasional attack of angina decubitus; both were relieved by glyceryl trinitrate. There was a strong family history of cardiovascular disease. On physical examination, the heart showed no enlargement but the rate was rapid and there was a faint gallop at apex; there was no other evidence of congestive failure. The blood pressure was type 2 (test range being 188 systolic and 123 diastolic to 210 systolic and 140 diastolic). Renal function was normal. The electrocardiogram showed changes consistent with coronary and hypertensive heart disease. A right transthoracic sympathectomy was done Oct. 24, 1946 from the first to the twelfth dorsal ganglion inclusive. A left transthoracic sympathectomy was done Nov. 13, 1946 from the first to the eleventh dorsal ganglion (bilateral Horner's syndrome). There was some slowing of the pulse rate following the right total thoracic sympathectomy but decided slowing of pulse rate following the bilateral total thoracic sympathectomy. There was complete relief of angina immediately after the operation, and definite improvement in the electrocardiogram.

Case 16.—H. H., a man aged 45 years, had had elevated blood pressure since 1942. His symptoms consisted chiefly of angina pectoris, headaches, fatigue and increased nervousness which first began in 1945. On physical examination the patient looked well. Fundi showed grade 1 (minimal) changes. No enlargement of heart was evident by roentgen rays but the electrocardiogram was consistent with coronary heart disease. The blood pressure was type 2 (test range 132 systolic and 88 diastolic to 168 systolic and 120 diastolic). Renal function was good. On April 3, 1947 a left transthoracic sympathectomy was performed from the first through the twelfth dorsal ganglion. A right transthoracic sympathectomy was done on April 30, 1947 from the first through the twelfth dorsal ganglion. There was moderate slowing of pulse rate following the left thoracic sympathectomy and decided slowing with decreased response to exercise following bilateral thoracic sympathectomy. Complete relief of angina followed the operation, with a normal electrocardiogram.

Case 17.—G. R., a woman aged 45 years, had had elevated blood pressure since 1932. Physical examination showed an overweight woman who appeared nervous and who had several attacks of pain during the course of her examination and during the exercise test. The heart was enlarged to the left. The blood pressure was type 2 (test range being 172 systolic and 115 diastolic to 232 systolic and 160 diastolic. The eyes showed hemorrhages in the fundi (grade 3). Renal function was good. Electrocardiographic changes were consistent with hypertensive and coronary heart disease. A right transthoracic sympathectomy was done on Feb. 24, 1947 from the first to the tenth dorsal ganglion and a left transthoracic sympathectomy was done on March 15, 1947 from the first to the eleventh dorsal ganglion. There was decided slowing of pulse rate with decreased acceleration to exercise following the operation. There was immediate relief of angina pectoris with moderate lowering of blood pressure immediately following operation. The electrocardiogram remained abnormal.

There was some effect in 4 patients after unilateral sympathetic denervation. Analysis of these 4 cases is

also of particular interest in trying to determine which side exerts a dominant influence on the heart rate. Of 2 who had the first to the eleventh dorsal ganglion removed from the left side first, 1 showed a decrease in the heart rate while the other showed a temporary acceleration. Of the other 2 who had a similar operation done on the right side first, there was a similar response.

In the last 2 patients with hypertension and tachycardia but without electrocardiographic evidence of coronary heart disease there was a pronounced diminution in the resting pulse rate and response to exercise after the right dorsal sympathetics were removed. There was some additional effect after the second or left side was operated on.

CASE 18.—R. C., a woman aged 48 years, was known to have had elevated blood pressure since 1939. Symptoms began at the same time, being chiefly fatigue, palpitation and occasional substernal oppression. There was no dyspnea, headaches or indigestion. Physical examination showed a patient who looked well. Blood pressure was of type 1, the blood pressure range being 196 systolic and 140 diastolic to 250 systolic and 168 diastolic; the fundi were grade 1; the electocardiogram was normal with exception of sinoauricular tachycardia, the rate being 126 per minute. Renal function and heart function were normal. Right transthoracic sympathectomy was performed on April 25, 1947 from the second through the twelfth dorsal ganglion. Left transthoracic sympathectomy was performed on May 15, 1947 from the second through the twelfth dorsal ganglion. There was pronounced lowering of pulse rate following right thoracic sympathectomy and some additional lowering following left thoracic sympathectomy, with decreased acceleration to exercise.

CASE 19.—E. D., a woman aged 48 years, was known to have had elevated blood pressure since 1945; symptoms became troublesome at about the same time and consisted chiefly of heart consciousness, headaches, nervousness and fatigue. There was no angina but palpitation was pronounced when the patient was emotionally stimulated and after exercise. The past history was noncontributory. Results of the physical examination were as follows: The blood pressure was type 3 as indicated by the cold and postural test; test range, 188 systolic and 114 diastolic to 250 systolic and 160 diastolic. The electrocardiogram was normal with the exception of sinoauricular tachycardia; rate, 110. Renal function and heart function were normal. The fundi were grade 2. Right transthoracic sympathectomy was performed on April 7, 1947 from the second through the twelfth dorsal ganglion. Left transthoracic sympathectomy was performed on April 28, 1947 from the second through the twelfth dorsal ganglion. There was pronounced slowing of pulse rate after the right thoracic sympathectomy with decreased response to exercise. Practically no additional slowing followed the left thoracic sympathectomy.

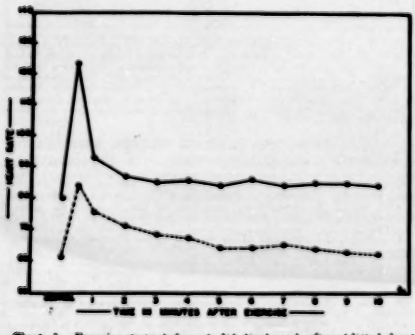


Chart 3.—Exercise tests before (solid line) and after (dotted line) cardiac denervation in 11 patients (see groups II, III and IV).

SUMMARY

Removal of the thoracic sympathetic ganglions from the second to the fifth dorsal inclusive on the left or right side usually causes some slowing of the basal pulse rate and a diminished pulse response to exercise. Removal of these ganglions from both sides invariably has had the greatest effect on heart rate. The cardiac innervation from the right thoracic sympathetic chain may exert a greater influence on heart rate than that from the left side in some persons, but the origin and course of cardioaccelerator fibers are variable. This variation between the two sides and from person to person is a known characteristic of the sympathetic nervous system.

The evidence so far indicates that in patients who have had more extensive resections of the sympathetic ganglions the effect on the pulse rate has been no greater than in those in whom only the second to the fifth dorsal ganglions inclusive were removed bilaterally. In fact, the effect of sympathectomy on heart rate was no greater in those patients who had splanchnic denervation, supposedly including the adrenals, than in those who had cardiac (second to fifth dorsal ganglion) denervation only.

## CONCLUSIONS

Motor pathways (cardioaccelerator fibers) to the human heart appear to be derived from both the right and left second, third, fourth and fifth thoracic sympathetic ganglions. When these ganglions are removed, there is a pronounced reduction in basal pulse rate as well as a diminished acceleration following exercise.

These preliminary observations suggest that this procedure may be of therapeutic value in the control of tachycardia and possibly other disturbances of cardiac rhythm in selected patients.

## ABSTRACT OF DISCUSSION

DR. KEITH S. GRIMSON, Durham, N. C.: It is not possible for me to discuss the treatment of tachycardia and of anginal pain or the justification of sympathectomy since my associates and I have not yet elected surgical treatment and do not favor alcohol block. It is possible, however, to speak of the effects of sympathetic denervation of the heart in 77 patients with hypertension treated during the last seven years by transthoracic subtotal to total sympathectomy. There is debate in the literature that sympathetic denervation of the heart might be good or bad for the coronary circulation in man and that bradycardia might aid or harm cardiac function. The denervation includes both the cardiopulmonary and the splanchnicadrenal-renal area. This operation is always followed by bradycardia and lessened acceleration during exercise of standing, particularly when vasoconstriction remains in the feet. This operation differs decidedly from the Smithwick operation for hypertension, which denervates only the splanchnic area and the lower half of the body and leaves compensatory postural and exercise tachycardia. Dr. Wright Adams ran master step exercise tests on my patients before and after subtotal to total transthoracic sympathectomy. Reduction of blood pressure and of pulse rate occurs, and after operation the recovery trend of blood pressure is up rather than down. Cardiac output in the supine position is reduced, as it is in normal dogs after total sympathectomy. The survival rate of these patients, in spite of an initial serious hypertensive disease process, has convinced us that sympathetic denervation of the coronary arteries and bradycardia is not harmful. Only 9 patients have died since operation. I can therefore approve of the studies presented by Dr. Chapman.

DR. C. HEYMANS, Ghent, Belgium: Series of experiments have been performed in our laboratory on dogs, cats and monkeys concerning the effects of the sympathetic and parasympathetic (vagus) on the heart rate. These experiments showed that the increase of heart rate during muscular exercise is principally due to a reduction of the vagal cardioinhibitory tone, to a slight increase of the sympathetic cardioacceleratory tone and to an

increase of secretion of epinephrine. In dogs in which complete sympathectomy has recently been done the heart rate only increases up to the automatic rate during exercise. After some weeks, the heart rate of these dogs increases, however, above the automatic rate during muscular exercise, probably by the action of cardioaccelerator fibers present in the vagus. The general behavior and the capacity to stand intense muscular exercise remain normal in dogs whose sympathetic chains have been completely removed. These observations have been confirmed by L. Brouha, W. B. Cannon and D. B. Dill (*J. Physiol.* 87:345, 1936). I should like to ask Dr. Chapman whether cardioaccelerator fibers coming from the brain and going to the heart through the vagus may also not be partly responsible for the increase of heart rate during muscular exercise in human beings on whom sympathectomy has been done.

DR. EARLE H. CHAPMAN, Boston: I want to thank Dr. Grimson for discussing his experience, which I believe corroborates ours, and then to say in reply to Dr. Heymans that it is gratifying that our observations came from patients who first were operated on for other reasons than to slow the heart. It was their own observations that stimulated us to consider this and go further with it. His observation of the fact that accessory fibers are carried down the vagi in the dog might be true in human beings, but we have no evidence as yet that points that way. We thought the variation in these persons from side to side indicates that even the normal pattern of anatomy of the sympathetic nervous system is a variable and diffuse one. Nature perhaps seeks many pathways in seeing that it gets its accelerator fibers to the heart. Another characteristic of the sympathetic is regeneration and the attempts to overcome these operative procedures. I might tell you about the first patient that was operated on 1942. He had no angina and no discomfort until April of this year, and he then returned and said that his left hand was becoming white again and his pain was returning, so that this procedure is still in the experimental stage and we see here five years later that nature has finally overcome us and sent fibers back through again. Total thoracic sympathectomy causes a fall in the blood pressure, as one expects with this operation, but the thing that one sees with low dorsal sympathectomy, which is an elevation of pulse rate, did not occur. In fact the fall in pulse rate is similar to that after severing only the ganglions from the second dorsal through the fifth dorsal. A nonhypertensive person had a pulse consistently in the upper forties after this upper dorsal sympathectomy, and some concern was felt because of her slow heart, but she has functioned well and has had no discomfort, and her electrocardiograms continue to be normal and she has resumed her activity, with pulse rates now in the sixties.

## PERIPHERAL VASCULAR DISEASE IN THE LUNGS

### Roentgenologic Manifestations

ROBERT P. BARDEN, M.D. and DAVID A. COOPER, M.D.
Philadelphia

Although there has been extensive study of the changes in the peripheral vessels of the systemic circulation when affected by disease either primarily or secondarily, medical literature contains relatively few references to diseases of the peripheral pulmonary vessels. By roentgenologic examination, there is available a window through which one may view the pulmonary circulation in a manner which cannot be utilized in the study of the blood vessels of the rest of the body. It would seem useful, then, to review our knowledge of the conditions which may affect the small vessels of the lung and examine the pathologic and roentgenologic manifestations of them.

In an excellent series of monographs, Brenner [1] has indicated that the arterioles, capillaries and venules of the lung may be subject to degenerative, infectious and neoplastic diseases similar to those encountered in the peripheral vessels of the systemic circulation, but accompanied by entirely dissimilar clinical states (the

*Pathologic Classification of Diseases of Pulmonary Arterioles and Capillaries* *

1. Sclerosis.
2. Endothelial proliferation.
3. Infections, acute and chronic.
4. Neoplasm.
5. Thrombosis.
6. Allergy.
7. Increased permeability.

* Modified after Brenner.[1] This is a classification, by pathology, of the material discussed in this paper. A great variety of clinical conditions may be included under these few pathologic headings.

table). Furthermore, because of the anatomic relation of the lung to the rest of the circulation, it receives in the sieve of its peripheral vessels emboli from a great variety of diseases, many of which become manifest for the first time only after the pulmonary complications.

To these general divisions in pathology may be added another, of more recent conception, that of the effects of hypersensitivity states on the pulmonary vessels. Alterations in the tone of the small vessels of the lung occur in many allergic states in which the vessels act as the sensitized shock organs.[2] In addition there is a group of diseases in which arteriole and capillary permeability is altered, throughout the body, and this abnormal state may be reflected in changes in the lung recorded by roentgenologic examination.[3]

For practical purposes of clinical diagnosis, peripheral vascular disease of the lung may be considered under three headings: intrinsic disease of the vessel wall or obstruction of the lumen; changes in vessels produced by adjacent disease of the pulmonary parenchyma, and toxic and hypersensitivity states resulting in increased permeability of vessel walls with or without demonstrable organic change in the vessel itself.

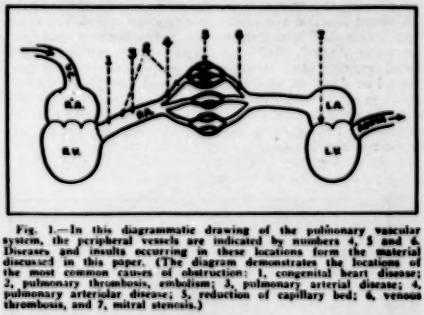


Fig. 1.—In this diagrammatic drawing of the pulmonary vascular system, the peripheral vessels are indicated by numbers 4, 5 and 6. Diseases and insults occurring in these locations form the material discussed in this paper. (The diagram demonstrates the locations of the most common causes of obstruction: 1, congenital heart disease; 2, pulmonary thrombosis, embolism; 3, pulmonary arterial disease; 4, pulmonary arteriolar disease; 5, reduction of capillary bed; 6, venous thrombosis, and 7, mitral stenosis.)

### INTRINSIC DISEASE OF PULMONARY VESSELS

In considering intrinsic disease of the pulmonary

From the Department of Radiology and the Department of Medicine, Hospital of the University of Pennsylvania, Philadelphia, Pennsylvania. Read before the Section on Radiology at the Ninety-Sixth Annual Meeting of the American Medical Association, Atlantic City, N. J., June 12, 1940.

1. Brenner, O.: Pathology of the Vessels of the Pulmonary Circulation, Arch. Int. Med. 56:211-237 (Aug.); 457-497 (Sept.); 724-752 (Oct.); 976-1014 (Nov.); 1189-1241 (Dec.) 1935.

2. Harkavy, J.: Vascular Allergy: Pathogenesis of Bronchial Asthma with Recurrent Pulmonary Infiltrations, Arch. Int. Med. 67:709-734 (April) 1941.

3. Rich, A. R.: Role of Hypersensitivity in Pathogenesis of Rheumatic Fever and Periarteritis Nodosa, Proc. Inst. Med. Chicago 13:270-280 (March 15) 1941. Barden, R. P., and Cooper, D. A.: The Roentgen Appearance of the Chest in Diseases Affecting the Peripheral Vascular System of the Lungs, Radiology, to be published.

vessels, arteriosclerosis, arteriolarsclerosis and pulmonary hypertension are conditions of interest on both pathologic and clinical grounds and because there is still controversy about their identity. Although it is well established that pathologic lesions of arteriosclerosis and obliterative arteriolarsclerosis are frequently found in the lungs, the exact relationship of these findings to pulmonary hypertension and to clinical states of pulmonary failure is not finally decided. While Brenner [1] expressed the opinion that clinical symptoms are rarely present when only these pathologic lesions are found, many others[2] have stated that pulmonary hypertension frequently exists in association with obliterative vascular disease and that pulmonary or cardiac failure commonly supervenes. The relationship of degenerative changes in small vessels to emphysema, on the one hand, and allergy, on the other, is also an interesting controversial point. It seems likely that as improved methods for measuring pulmonary blood pressure during life are developed, some of these points of difference between pathologists and clinicians may be resolved.

However, from the standpoint of the roentgenologic examination of the lungs, one may suspect obliterative vascular disease under certain conditions. First, it so regularly accompanies advanced degrees of pulmonary emphysema that it may be considered as a corollary to that roentgen diagnosis. Second, it should be suspected in patients without emphysema but with pronounced symptoms of pulmonary insufficiency, on the basis of the negative evidence of a roentgenogram showing little deviation from the normal. And third, when pulmonary hypertension from whatever cause has lasted sufficiently long, failure of the right side of the heart ensues with roentgen observations which may be bizarre (Figs. 2 and 3).

Fig. 2.—From a roentgenogram of the chest of a patient with increasing dyspnea and cyanosis of several years' duration. Because of increased pulsation of the large pulmonary vessels, observed fluoroscopically, and the peculiar cardiac silhouette, it was thought that congenital heart disease was present. Postmortem examination showed a cor pulmonale and no congenital lesion of the heart. There was advanced pulmonary emphysema and fibrosis with obliteration of the lumen of many of the arterioles. It was considered that the increased pulmonary pressure secondary to a decreased arterial bed had resulted in cardiac enlargement and failure.

Fig. 3.—Photomicrograph of section of lung from a patient with a clinical history like that of the patient in figure 2, and showing extreme degrees of arteriosclerosis. Notice that the lumen of the arteriole in the center of the field has been reduced to a mere slit by the thickening of the intima.

Intrinsic disease which results in obstruction of vessel lumina by foreign material acting as emboli is usually recognized when large vessels are involved and infarcts ensue. However, the concept of bloodless infarcts which cast no roentgen shadow has been described by Westermark [3] and is not widely appreciated. Furthermore, when minute pulmonary blood vessels are obstructed by multiple emboli of whatever nature, the clinical and roentgenologic findings are often difficult to interpret. The predominant roentgen changes are usually exaggeration of the shadows cast by the peripheral vascular bed associated with irregular "beading" which may later become the picture of a diffuse, symmetric bronchopneumonia. Septic and organic and inorganic fragments circulating in the systemic blood vessels are commonly thought to account for the majority of pulmonary emboli.[4d] However, when one considers that pulmonary emboli are regularly associated with some neoplasms, such as carcinoma of the kidney, testis and liver, and may present as the first symptom of others, notably carcinoma and sarcoma of the stomach,[6] or that emboli and thromboses of pulmonary arterioles and capillaries may be expected at some stage of the disease in most leukemias and polycythemia vera, or that a great variety of parasitic infestations, such as malaria,[7]

4. (a) Moschcowitz, E.: Hypertension in the Pulmonary Circulation, Am. J. M. Sc. 174:388-406 (Sept.) 1927. (b) Schmidt, M. J., and Stewart, H. L.: Hyperplastic Sclerosis of the Pulmonary Artery and Arterioles, Arch. Int. Med. 51:403-412 (March) 1933. (c) Kaump, D. H., and Dry, T. J.: Pulmonary Arteriolar Disease, ibid. 61:1-18 (Jan.) 1938. (d) de Takats, G., and Jesser, J. H.: Pulmonary Embolism: Diagnosis, Prevention, Management, J. A. M. A. 114:1415-1420 (April 13) 1940.

5. Westermark, N.: On the Roentgen Diagnosis of Lung Embolism, Acta radiol 19:357-372, 1938.

6. Greenspan, E. B.: Carcinomatous Endarteritis of the Pulmonary Vessels Resulting in Failure of the Right Ventricle, Arch. Int. Med. 54:625-644 (Oct.) 1934.

7. Hodes, P. J., and Fitz-Hugh, T., Jr.: Bronchopulmonary Infections in Malaria, to be published.

schistosomiasis,[8] ascariasis, uncinariasis, and paragonimiasis [9] may affect the peripheral pulmonary vessels and knowledge of all the diseases which must be included in the differential diagnosis (figs. 4 and 5).

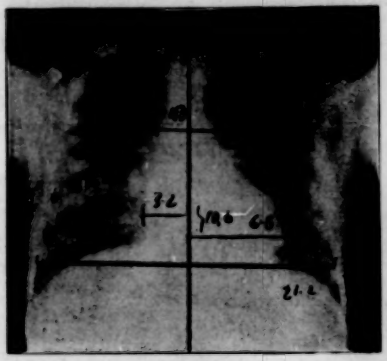

Fig. 4.—A girl aged 12, with cyanosis and dyspnea of four months' duration. She had a history of bathing in water infected with Schistosoma. The ova of this parasite were found in the feces, and the peripheral blood contained 35 per cent eosinophilic cells. Postmortem examination of the lungs in patients with this disease often reveals multiple capillary emboli formed by ova circulating in the blood. In the roentgenogram of the chest of this patient, one sees enlargement of the hilar shadows and increased prominence of the pulmonary markings with peripheral shadows in the lower lobes suggesting lobular atelectasis or confluent bronchopneumonia. (This illustration was furnished by Dr. Enrique Koppisch, School of Tropical Medicine, San Juan, Puerto Rico.)

Fig. 5.—Photomicrograph of a section of lung from a patient with schistosomiasis. The dark irregular bodies in the center of the field are ova lodged in pulmonary capillaries. The inflammatory response is not pronounced. (This illustration was furnished by Dr. Enrique Koppisch.)

by embolism, it becomes clear that interpretation of these roentgenograms of the chest requires skill, experience

8. Clark, E., and Graef, I.: Chronic Pulmonary Arteritis in Schistosoma Mansoni Associated with Right Ventricular Hypertrophy, Am. J. Path. 11: 693-705 (July) 1935.
9. Koppisch, E.: Personal communication to the authors.

## CHANGES IN VESSELS FROM ADJACENT DISEASE OF PULMONARY PARENCHYMA

The concept that primary diseases of the lung cause changes in and obliteration of adjacent blood vessels is not new. Nevertheless, it is useful to recall that delayed or abortive healing of many of these conditions is due to

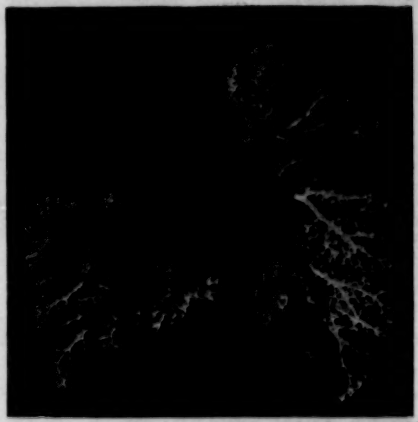

Fig. 6.—Specimen of an excised normal lung with radiopaque material injected into the vascular system. Notice the extensive ramifications of the vessels at the pleural edges. (After Barbelo and Brosius.[10])

Fig. 7.—Radiopaque material has been injected into lungs from a patient with far advanced pulmonary tuberculosis. Note the reduction in the number of small vessels in the right lung in particular. (After Barbelo and Brosius.[10])

irreversible damage to the blood supply of the part of the lung involved, and not, as might appear to superficial analysis, to continuation of the disease process itself. A progressive obliterative endarteritis may

accompany acute pneumonias of any type and is always found in chronic inflammatory conditions and neoplasms of the lung. Progressive loss of blood supply is one of the fundamental pathologic changes accompanying chronic pulmonary tuberculosis[10] (figs. 6 and 7) and is also seen in silicosis with the development of large anemic infarcts, and this process is directly related to the impaired pulmonary function so regularly found in these conditions. The combination of restricted ventilatory capacity due to interstitial fibrosis and pleural thickening, and arterial disease, rapidly exhausts the reserve of the pulmonary system and produces pronounced symptoms of respiratory insufficiency.[8] It is therefore important in evaluating the roentgenologic evidence of primary pulmonary disease to bear in mind the factor of peripheral vascular disturbance and its influence on pathogenesis, treatment and prognosis.

### TOXIC AND HYPERSENSITIVITY STATES

The response of peripheral pulmonary vessels to a hypersensitivity state of the body as a whole is a nonspecific one, as Gregory and Rich have shown.[11] Reversible changes are found in some forms of bronchial asthma in which the pulmonary vessels act as shock organs.[12] As sensitization becomes more profound, organic destruction of the vessel walls occurs with necrosis. The pathologic lesion of blood vessels produced in this way has been found in experimental animals and man and is indistinguishable in a great variety of clinically and etiologically different conditions. It may be found in poisoning with sulfonamide compounds and serum sickness of all types and occurs as part of such generalized diseases as eczema, lupus erythematosus, acute rheumatic fever and periarteritis nodosa.[13]

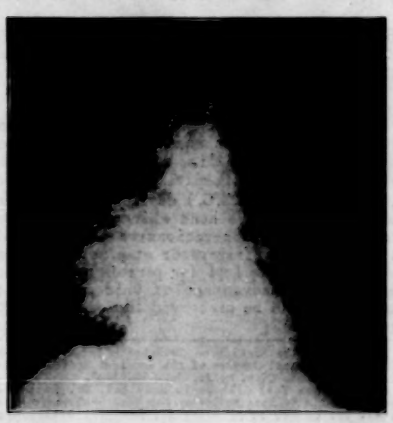

Fig. 8.—Roentgenogram of the chest of a patient with periarteritis nodosa, during an episode of acute pulmonary failure. Notice the position, rather symmetric distribution and fluffy character of the shadows. They may be evanescent, and disappear almost completely in twenty-four to forty-eight hours, as occurred in this patient.

The uniform response to such functional or organic impairment of the integrity of the vessel wall is its increased permeability to serum and plasma resulting in patchy or massive edema in the lungs and reflected by a characteristic shadow pattern on the roentgenogram of the chest (fig. 8).

The usual appearance is that of massive, fluffy shadows extending outward from each hilus in a symmetric fashion and occupying the inner two thirds of each pulmonary field. The periphery of these shadows blends imperceptibly with the adjacent aerated lung. In patients with less explosive symptoms the roentgen picture may be that of scattered subpleural shadows, again without definite margins and rapidly enlarging and merging together. Finally, in chronic or recurring subacute diseases, the appearance may be indistinguishable from bronchopneumonia.[11] The unusual features of the roentgen findings are the hilar or subpleural location of the shadows and the "cotton wool" appearance which they present. If healing occurs, as in some instances of acute rheumatic fever, pulmonary nodulation results, and may be depicted by the roentgenogram (fig. 9).

Fig. 9.—Roentgenogram of the chest of a patient who had recovered from acute fulminating rheumatic fever with pulmonary involvement. The fine, symmetric nodulation simulates silicosis. The appearance of the lungs has not changed during a twelve year follow-up period during which the patient has remained well. The pulmonary nodules are thought to be due to perivascular foci of connective tissue or deposits of hemosiderin.

The exact composition of these nodules is in dispute, some believing they are formed by perivascular connective tissue[13] and others stating that they represent deposits of hemosiderin remaining after resorption of extravasated red blood cells.[14]

The effects of exogenous or endogenous toxins on the walls of small vessels are identical in every way with the manifestations of hypersensitivity. Thus, pulmonary edema or hemorrhage follows such widely different conditions as the inhalation of irritating gases, epidemic influenza and glomerulonephritis in its terminal stages. In these three ex-

10. Birkelo, C. C., and Brosius, W. L.: Roentgen Visualization of Pulmonary Arterial Circulation in Autopsy Material, Radiology **31**: 261-292 (Sept.) 1938. Charr, R., and Savacool, J. W.: Changes in the Walls of Tuberculous Pulmonary Cavities, Arch. Path. **30**: 1159-1171 (Dec.) 1940.

11. Gregory, J. E., and Rich, A. R.: Experimental Production of Anaphylactic Pulmonary Lesions with Basic Characteristics of Rheumatic Pneumonitis, Bull. Johns Hopkins Hosp. **78**: 1-12 (Jan.) 1946.

12. Harkavy, J.: Vascular Allergy, J. Allergy **14**: 507-537 (Nov.) 1943.

13. Grant, R. T.: Observations on Periarteritis Nodosa, Clin. Sc. **4**: 245-276 (Oct.) 1940.

14. Ekelcs, A., and Glynn, L. E.: Serial Roentgenograms of the Chest in Periarteritis Nodosa as an Aid to Diagnosis, Brit. J. Radiol. **17**: 368-373 (Dec.) 1944.

15. Pappenheimer, A. M., and Von Glahn, W. C.: Specific Lesions of Peripheral Blood Vessels in Rheumatism, Am. J. Path. **2**: 235-249 (May) 1926. Epstein, E. Z., and Greenspan, E. B.: Rheumatic Pneumonia, Arch. Int. Med. **68**: 1074-1094 (Dec.) 1941.

16. Scott, L. D. W.; Park, S. D. S., and Leudrum, A. C.: Symposium: The Clinical, Radiological and Pathological Aspects of Pulmonary Hemosiderosis, Brit. J. Radiol. **20**: 100-107 (March) 1947.

amples, increased permeability of peripheral vessels occurs as a result of the injury caused by (a) chemical, (b) bacterial and (c) metabolic poison.

To complete this review, it should be mentioned that changes on roentgenograms of the chest may be found in some deficiency states when vascular permeability is altered. This has been suggested as occurring in long-standing protein deficiency and beri-beri,[17] and more recently in a peculiar iron deficiency described by Waldenstrom.[18]

From the foregoing discussion, it is evident that specific roentgenographic changes cannot be expected in the many disease entities which involve the small vessels of the pulmonary system. However, in some of these conditions a shadow pattern characteristic of vascular damage may develop during roentgenologic study. If this evidence is properly evaluated, it may point the way to further investigation and clarification of an otherwise obscure disease, and thus render invaluable assistance to the patient.

SUMMARY

An attempt has been made to point out the roentgenologic manifestations of a great variety of diseases which affect the peripheral blood vessels of the lung and may produce changes in roentgenograms of the chest. These conditions include arteriolarsclerosis, emboli of all types, many primary pulmonary diseases and allergic and hypersensitivity states of the lung or the body as a whole.

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ABSTRACT OF DISCUSSION

DR. FRANCIS M. RACKEMANN, Boston: I have a special interest in this paper, for it suggests an approach to an important problem. What happens when a man remains healthy up to the age of about 50 and then suddenly gets asthma which persists and may become severe? In order to answer that question one must know much more about the function of the lung. The symptom might depend on some lesion in the smaller bronchi or on a lesion in the alveolar membranes or in the lymphatics of the lung, but as Drs. Barden and Cooper point out, it is most likely that the lesions are located in the pulmonary blood vessels. The roentgenologists with whom I talk tell me that these diffuse shadows that one sees so often are of blood vessels much more than of the bronchi, even though one concedes that at the same time the bronchi are infected and that there is thickening of the bronchial wall. In ordinary cases the roentgenogram indicates pathologic changes that are gross, so that at autopsy one can see them without a microscope. It is hard to consider how the roentgenogram can show lesions which are microscopic, but this paper shows, again, that when microscopic lesions are grouped together a characteristic change occurs and that change is gross and therefore can be demonstrated by the roentgenogram. It is important to notice that the changes here are diffuse, throughout both sides of the chest and therefore in great contrast to other lesions which are localized to one lung or, better still, to one area of one lung. Another thing that is important—and it is a good argument for the conception that these lesions are of vascular origin—is the fact that in the considerable variety of clinical states which Dr. Barden has described the roentgen lesions are much the same in each one of them. After all, is not that quite what it should be, if one assumes that the lesions depend on vascular disturbances which are scattered throughout the lung field? Are they not produced by a mechanism, the principle of which is common and the same in each case? This paper has given me much food for thought, and I am grateful accordingly to Drs. Barden and Cooper.

17. Weiss, S., and Wilkins, R. W.: The Nature of the Cardiovascular Disturbances in Vitamin Deficiency States, T. A. Am. Physicians 51: 341-373, 1936. Mecray, P. M.; Barden, H. P., and Ravdin, I.: Nutritional Edema, Surgery 13:33-64 (Jan.) 1943.

18. Waldenstrom, J.: Relapsing Diffuse Pulmonary Bleedings or Hemosiderosis Pulmonum, Acta radiol. 25:149-167, 1944.

# THE BONE BANK

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Danville, Pa.

and

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The necessity for additional bone for certain orthopedic operations has undoubtedly presented itself to surgeons many times. Secondary operations to obtain more bone are the result, thus prolonging the operative time, increasing morbidity and occasionally promoting a complicating factor. In certain patients, especially children, it may be difficult or impossible to obtain enough autogenous bone for the operation. Spinal fusions for scoliosis and disorders of the lower part of the back, the filling of large bone cysts and the replacement of defects in bone are a few of the common problems in which large quantities of bone are necessary. Macewen[1] in 1878 was the first to report the use of homogenous bone to rebuild a humerus. In recent years Ghormley[2], Inclan[3] and Smith[4] have reported the use of homogenous and syngenesious bone with good results. Inclan reported success in 24 of 34 cases with autogenous bone and in 6 of 8 cases with homogenous bone preserved in a refrigerator at plus 2 to plus 5 C. in saline solution, in saline solution and blood, or in citrate and blood. Smith in 2 cases kept bone in a refrigerator at approximately plus 4 C. and then autoclaved it just prior to use. In a hitherto unpublished case (Jan. 9, 1942) he employed bone refrigerated eighteen days without further treatment except washing in saline solution before using.

In 1945 the need for more bone became so apparent in patients suffering from severe scoliosis that Dr. William H. Von Lackum of the New York Orthopedic Hospital suggested a "bone bank." One of us (C.Z.G.) designed the bottles for storage. Excess bone which was formerly discarded in many operations was then placed in an ordinary refrigerator at plus 2 to plus 5 C., where it was kept for periods up to three weeks. The disadvantage of this method was that bone could be preserved for only a short period of time.

Read before the Section on Orthopedic Surgery at the Ninety-Sixth Annual Session of the American Medical Association, Atlantic City, N. J., June 13, 1947.

From the New York Orthopedic Hospital. Dr. Bush was formerly Annie C. Kane Fellow at New York Orthopedic Hospital. Dr. Garber is Pathologist, New York Orthopedic Hospital.

1. Macewen, W.: The Growth of Bone: Observations on Osteogenesis; an Experimental Inquiry into the Development and Reproduction of Diaphyseal Bone, Glasgow, James Maclehose and Sons, 1912.

2. Ghormley, R. K., and Stuck, W. G.: Experimental Bone Transplantation with Special Reference to the Effect of "Decalcification," Arch. Surg. 28: 742 (April) 1934.

3. Inclan, A: The Use of Preserved Bone Graft in Orthopaedic Surgery, J. Bone & Joint Surg. 26: 81, 1942.

4. Smith, A. DeF.: Use of Homologous Bone Grafts in Cases of Osteogenesis Imperfecta, Arch. Surg. 34:687 (April) 1937.

A review of the literature[5] gave some help on the problem of preservation of tissues but little regarding bone, especially for prolonged periods. We decided that if foods, serums and other perishable substances could be kept in a low temperature freezing cabinet, then perhaps this method could be used to preserve bone so that a constant supply would be available at all times. Experiments were undertaken to determine whether this was safe and what the tissue reactions would be to bone which had been preserved by freezing, whether autogenous or homogenous. The ilium, being

Figure 1.--Autogenous graft, fresh, 28 days in animal 107. Result was graded as "excellent."

cancellous bone and readily accessible, was considered as being suitable for studying osteogenesis and tissue reactions.

### Experimental Studies

Large chinchilla rabbits were used. Control studies were made with fresh autogenous and fresh homogenous grafts. Both iliac bones were used so that a parallel study could be made under the same conditions for both types of bone.

The next series of experiments dealt with bone which had been stored in a freezer at approximately minus 24 C. With the rabbit under pentobarbital sodium anesthesia, the bone was removed, placed in storage bottles and frozen for periods of one, two, four, eight and twelve weeks before being grafted. The homogenous grafts were placed on the left ilium and the autogenous grafts on the right ilium. The grafts were removed with a ¾ inch (1.9 cm.) tubular saw fashioned from a cork drill so that the bed and the graft were always of the same shape and size. The grafts were held in place by means of tantalum wire, which was threaded through drill holes in the graft and in the ilium and twisted until the graft was held firmly in place. The wounds were closed with interrupted cotton sutures. There were no casualties and in only one wound was there a superficial infection. The rabbits were killed at three and six week intervals, and the grafted areas were studied grossly, roentgenographically and microscopically. Thirty-two bone transplantations were made by twenty-eight operations on 19 animals. Twenty-nine of the grafted areas were considered suitable for analysis. Results are expressed in terms of a "healing index" as shown in table 1.

TABLE 1.—*Order of Healing of Grafts*

| | | Healing Index* |
|---|---|---|
| 1. Autogenous fresh | 13/5 | 2.6‡ |
| Autogenous frozen 7 days | 8/3 | 2.66† |
| 2. Autogenous frozen 14 days | 5/3 | 1.66§ |
| Homogenous fresh | 6/4 | 1.5 |
| Autogenous frozen 28-84 days | 4/3 | 1.33 |
| 3. Homogenous frozen 7-84 days | 7¾/7 | 1.07¶ |
| Autogenous boiled | 2/2 | 1.0 |
| 4. Homogenous frozen boiled | 1/2 | 0.5 |

*This is a figure derived from a numerator representing a summation of grading figures and a denominator denoting the number of transplants involved. In grading the individual case 4 equals excellent (pronounced restitution toward normal architecture), 3 equals excellent to good, 2 equals good (graft fused to bed of host, metaplastic new bone formation along at least one side of the cortex and also extending up into medulla for a short distance), 1 equals fair (graft only fused to bed of host, with or without callus on one side of cortex) and 0 equals non-union (or excessive peripheral resorption of bone and little formation of new bone).

‡Figure 1. §Figure 3.
†Figure 2. ¶Figures 4 and 5.

Frozen bone grafts regularly became attached to suitably prepared beds of host bone and were slowly and at least partially replaced by new bone formed by the host through metaplasia or creeping substitution. Fresh autogenous bone and autogenous bone preserved in frozen condition for one week and even for two weeks were more quickly and completely reconstituted into bone approaching normal architecture than frozen homogenous bone, but there was little difference in favor of autogenous bone when preservation in the frozen state was prolonged beyond twenty-eight days. This seems to indicate that the autogenous bone cells usefully survived freezing at minus 24 C for one week and that some cells survived for two weeks. The possible effect of slow denaturization of autogenous protein is also to be considered.

5. (a) Marchand, F.: Der Process der Wundheilung mit Einschluss der Transplantation, Stuttgart, Ferdinand Enke, 1901. (b) Carrel, A.: The Preservation of Tissues and Its Applications in Surgery, J.A.M.A. 59:523 (Aug. 17) 1912. (c) Keith, W.S.: Small Bone Grafts, J. Bone & Joint Surg. 16:314, 1934. (d) Matthews, D.N.: Storage of Skin for Autogenous Grafts, Lancet 1:775, 1945. (e) Strumia, M.M., and Hodge, C.C.: Frozen Human Skin Grafts, Ann. Surg. 121:860, 1945. (f) Waterman, A.J.: Viability of Embryonic Chick Tissues Following Storage at Low Temperatures, Growth 8:175, 1944. (g) Webster, J.P.: Refrigerated Skin Grafts, Ann. Surg. 120:431, 1944. (h) Mider, G.B., and Morton, J.J.: Effect of Freezing in Vitro on Some Transplantable Mammalian Tumors and on Normal Rat Skin, Am. J. Cancer 35:502, 1939.

Epiphysial cartilage attached to bone which had been frozen for two weeks was necrotic when examined three or more weeks after implantation and was noted to interfere locally with formation of new bone. Boiled autogenous bone grafts were inferior to frozen bone grafts, the medulla being poorly revascularized and showing no formation of new bone. The importance of reestablishing circulation in bone transplants is indicated by the inferior formation of new bone in several animals in which grafts had become angulated thereby preventing revascularization directly from medulla of the host.

Figure 2.--Autogenous graft, frozen at minus 25 C. for 7 days prior to implantation, 21 days in animal 107. Result was graded as "excellent."

Figure 3.--Autogenous graft, frozen at minus 25 C. for 14 days prior to implantation, 42 days in animal 108. Result was graded as "excellent."

Figure 4.--Homogenous graft, frozen at minus 25 C. for 14 days prior to implantation, 42 days in animal 108. Result was graded as "fair to good." There was poor revascularization of marrow in the graft.

The inclusion of boiled autogenous bone as a part of this experiment is not without merit in establishment of a base line. Accidents in operating rooms have occasionally resulted in enforced use of such material, and with clinical success. Numerous experiments with animals recorded in the literature[6] have shown that boiled grafts can be made to succeed though they do so rather slowly as compared with fresh autogenous grafts. The healing index of our homogenous frozen bone was in the same range as that of autogenous boiled bone, though slightly higher. More exact establishment of this point with a considerable number of dogs is desirable.

## CLINICAL STUDIES

Having proved that this method of preserving bone was successful in animals, we felt that it was safe to attempt it in man. Thus all available clean fresh bone was placed in

6. Marchand,[5a] Key, J.A.: The Effect of a Local Calcium Impot on Osteogenesis and Healing of Fractures, J. Bone & Surg. 16:176, 1934. Orell, S.: Surgical Bone Grafting with "Os Purum," "Os Novum," and "Boiled Bone," J. Bone & Joint Surg. 19: 873, 1937.

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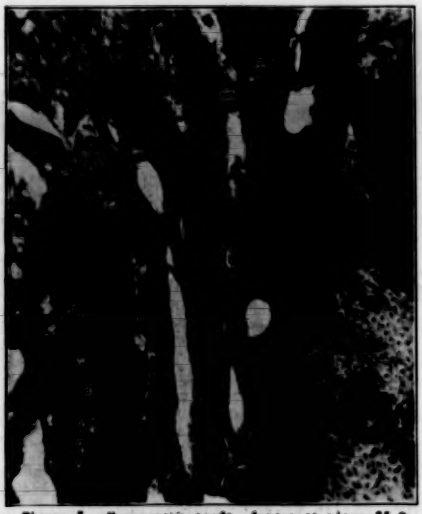

Figure 5.--Homogenous graft, frozen at minus 25 C. for 84 days prior to implantation, 21 days in animal 103. Result graded as " fair to good" at low power. However, this high power view shows formation of abundant cartilage callus and metaplastic osteoid tissue adjacent to the necrotic eroded bone of the graft.

bottles as illustrated (fig. 6) and frozen at minus 25 C. Because infection developed in 1 case, the bone is now kept for two weeks before using, while the donor remains under observation for evidence of developing wound infection. In a previous paper by one of us (L.F.B.)[1] the additional precautions of a negative serologic reaction for syphilis and no history of recent jaundice, malaria or infection were outlined. All the necessary data concerning the donor and the specimen are filed in a card index (table 2).

Figure 6.--Illustrating a set of bottles containing bone with the proper labels. Bottles are of the screw cap type. An additional protection is a piece of rubber sheeting which is held in place by two strong rubber bands.

*TABLE 2.—Data Kept in Card Index*

| | |
|---|---|
| **Bone Bank** | |
| Donor's Name: | Hospital No. |
| Source of Bone: | Weight of Bone* |
| Recent Infections: | |
| Wassermann: | |
| Date Stored: | |
| **Recipient** | |
| Name: | Hospital No. |
| Operation: | |
| Date Used: | |

*The weight of the bone is recorded chiefly to give an index as to the amount of bone present in the bottles.

The donor bone is obtained from any clean source, the largest and best supplies coming from the tibia and the ilium. By the exercise of diligence, considerable bone may be accumulated from many sources. In operative procedures in which part of the ilium is sacrificed and in many others in which the tibia is exposed for autogenous onlay grafts, extra bone may be placed in the bottles for the bank. Bone used to date has been from living sources. Larger quantities of bone will be obtained eventually from other clean sources in instances of death by trauma, still-born infants, and clean amputations. Autogenous bone may likewise be stored for use in secondary operations.

## CLINICAL RESULTS

At the present time homogenous bone has been used in 126 operations in 104 patients. Of these, 24 operations were by direct transfer; refrigeration at plus 2 to plus 5 C. was used in 37 instances, and the bone was stored in deep freezer for 43 operations.

Donor bone has been used in any case in which extra bone was required, the chief uses being spinal fusions for scoliosis and diseases of the lower part of the back; filling bone cysts with chips; fusions of various joints and rare diseases such as osteogenesis imperfecta. The addition of homogeneous bone after a Hibbs type of spinal fusion has proved to be most helpful, judging from the results studied in 91 patients.

The evidence accumulated to date shows that donor bone is of definite value in bone-grafting operations. The time required for operations is lessened and the necessity of second-

1. Bush, L. F.: The Use of Homogeneous Bone-A Preliminary Report on the Bone Bank, J. Bone & Joint Surg., to be published.

ary operations in many instances is eliminated.

Biopsy studies have been possible where homogenous bone was used in multistage spinal fusions for scoliosis. Microscopic examination of the tissues seemed at first discouraging, because the bone spicules of the graft were dead and disintegrating and exhibited a relatively small amount of marginal metaplastic new bone, but grossly there appeared to be excellent formation of new bone. The donor bone furnished a framework for the formation of new bone by substitution and by furnishing the necessary calcium for this new bone.

*TABLE 3.—Summary of Data on 126 Operations*

| | |
|---|---|
| Total patients - | 104 |
| Total operations - | 126 |
| Operations: | |
| Spinal fusions | |
| (a) Scoliosis | 44 |
| (b) Lumbosacral | 14 |
| (c) Repair pseudarthrosis | 18 |
| (d) Spinal fracture | 4 |
| (e) Adolescent kyphosis | 3 |
| (f) Tuberculosis of spine | 8 |
| Bone cysts, filling with chips | 6 |
| Ununited fractures in osteogenesis imperfecta | 4 |
| Fusion, wrist | 2 |
| Onlay graft for congenital pseudarthrosis of tibia | 1 |
| Infections—2 | |

## COMPLICATIONS

Complications have been few. In the 104 cases in which donor bone was used, there were 4 complications, as follows: infections, 2; fracture of onlay grafts, 1, and failure of soft tissue coverage, 1.

## SUMMARY

Experimental bone-grafting studies on rabbits showed: *(a)* Freezing at low temperature is a safe method of prolonged preservation of bone for grafting purposes. *(b)* Bone grafts three to six weeks after implantation were successful in the following descending order efficiency: (1) autogenous fresh, autogenous frozen 7 days, (2) autogenous frozen 14 days, homogenous fresh, autogenous frozen 28 to 84 days. (3) homogenous frozen 7 to 84 days, autogenous boiled. The implications of these results cannot be extended from rabbit to man with any certainty, and the experiment should be repeated with a large number of other animals. *(c)* Epiphysial cartilage attached to bone which had been frozen for two or more weeks became histologically necrotic after implantation and interfered locally with osteogenesis. *(d)* Circulation played a most significant role in the success of grafting experiments. Proper seating of the graft was important.

Human bone is preserved apparently indefinitely in a freezer at minus 20 to 30 C. Donor bone has been used in 126 operations on man with but 4 complications.

The successful results obtained prove the value of donor bone which the bone bank makes available in a constant supply.

## ABSTRACT OF DISCUSSION

Dr. J. R. COBB, New York: The development of the bone bank is one of the most important advances in orthopedic surgery. Our experiences at the Hospital for Special Surgery support this work of Dr. Bush and Dr. Garber. During the past twelve years we have studied the healing of the patient's own bone in the two stage fusion operations for scoliosis. Some of the patient's tibial bone chips used for the first stage spinal fusion were removed at the second stage (at varying intervals of two weeks to several months) and studied microscopically. These specimens all show dead and revascularizing bone. Whether we use the patient's own fresh bone or refrigerated bone from the same patient or from other donors, the results seem to be essentially the same both clinically and on microscopic examination. We have been using a bank for refrigerated bone since April 1946. Dr. Philip Wilson reported our results at the meeting of the American Surgical Association on March 27, 1947. At that time we had used refrigerated bone from 38 donors in 28 operations on 23 recipients. As an indication of our satisfaction with the results to date we have already increased these figures to 51 donors and 41 recipients. We have had no infections and our only complications have been: 1 instance of pseudarthrosis in a spinal fusion for transection of the cord with anesthesia when adequate immobilization in plaster was impossible because of pressure sores; 1 extrusion of chips following an attempt to fuse and repair a spinal fluid leak, and 1 soft tissue slough which healed in a few days. While we usually wait 72 to 96 hours for a negative culture report before using the bone, we have used it the same day and as late as 89 days, the average being 42 days. We believe that if it is kept constantly at a sufficiently low temperature without contamination and properly sealed bone can be kept indefinitely, but we have so many needs for extra bone that it does not stay in the bank long. In most of our cases we have given the recipient 50,000 units of penicillin every three hours for the first few days or until the temperature is normal. In 1 case of severe paralytic scoliosis we used bone from 9 donors in a three stage fusion, with excellent results. All of us who have used refrigerated bone have been impressed by the simplicity, safety and usefulness of the bone bank. However, while a bone bank on a small scale is desirable in every hospital with an active bone and joint service, there are great potentialities for further development of the bone bank. As

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Dr. Wilson has pointed out, we need an organization on a much larger scale, of a community bone bank to supply the needs of surgeons for bone transplants of every size and description. This work by Dr. Bush and Dr. Garber is an important step toward that goal.

DR. FRANK E. STINCHFIELD, New York: The purpose of a bone bank is not to replace the use of autogenous bone but to serve as an adjunct in grafting when it is impossible to obtain enough bone from autogenous sources. There is definite proof, both experimentally and clinically, that autogenous bone is better than homogenous bone. It is almost impossible to do a purely homogenous bone graft since it will always be combined with autogenous bone which has been chipped at the site of the graft. The most important requisites in bone grafting are a careful preparation of the host bed and an adequate blood supply to the involved area. The problem of histopathology of bone repair is incompletely understood, but it would seem that the bone graft supplies local calcium and acts as a trellis on which the new bone is formed. It is doubtful that many—or any—of the cortical cells survive, although I believe that some of the autogenous cancellous bone cells live. It is difficult to see under the microscope the relative viability of living bone cells in the early states of repair, and the death of cells can be noted only when the lacunas are absolutely empty. The paper fairly well refutes the theory that there is incompatability of individuals in receiving homogenous bones and that the poor results are due to blood or tissue incompatability. Brooks proved that autogenous bone grafts in young dogs grow better than in older ones but that homogenous bone transplants have no relationship to the age of either donor or recipient. It is my impression from reviewing bone grafts in human beings that the best results are obtained when bone is transplanted from adult to adult rather than from youth to adult as one might expect. The problem of bone preservation is one of prime importance at the present time. The National Research Council, the Medical Department of the Veterans Administration and the United States Army are all interested in determining how to store bone at low temperatures so that it may be used at a later date. Much work has been done on the clinical application of homogenous bone from a procedural point of view, but little has been done on the basic problem of determining the physiologic and histologic processes which occur when bank bone is used. Another interesting problem would be to determine the rapidity with which the bone should be frozen and the rate at which it should be thawed out. These two factors alone might make a great deal of difference. Too, it might be advisable to take cultures of the specimens at the time of surgery and also immediately before implantation of the bone graft in the host. I am much interested in knowing how long the authors feel that bone can be stored and still used advantageously. In time of war this may be an important factor. The unfortunate publicity which has accompanied the establishment of bone banks throughout the country is disturbing. The obtaining, preservation and use of bank bone is not as simple as it sounds, and such publicity is apt to cause some disastrous results. It should be borne in mind that a bone bank is different from a blood bank, as in blood transfusions there are no regenerative powers attendant whereas in bone transplants the host must do more than just tolerate the alien tissue. My feeling is that we should proceed cautiously and not use bank bone indiscriminately until we have more definite data and a longer follow-up.

DR. D. B. PHEMISTER, Chicago: I think that it should be more definitely established by histologic studies both in experimental animals and in man whether or not the homogenous banked bone transplants form new bone which persists and takes part in the union and bony transformation of the graft. It has been reported by Marine, Lexer, Axhausen and others that in homologous transplants--some in man and others in experimental mammals--the surface cells may survive and multiply but that after ten or twelve days a foreign protein reaction against the graft develops in the host and the new tissue, which it has formed, dies. Replacement of the dead graft is then brought about by proliferation and invasion of the tissue of the host. The evidence presented here appears to be conclusive that banked homogenous bone functions satisfactorily when used as a transplant. The question to be settled is whether it acts as well as autogenous bone or only in a capacity comparable to that of boiled bone,which has also proved satisfactory in certain types of cases.

DR. LEONARD F. BUSH, Danville, Pa.: There are several points that we could have clarified in this paper had we had more time. Many of these were previously brought out in the paper presented in New York in February, 1947. It was not the purpose, or not our point, to make you think that homogenous bone is a panacea. Certainly, it is not as good as autogenous bone but it has a place, and when autogenous bone is not available, this is the second best substance. We showed definitely in the first paper that the homogenous bone did not grow. We had twelve biopsies, all of which showed dead spicules of bone with pronounced metaplasia of connective tissue cells and new bone formation, but we felt that this is somewhat in direct contrast to the autogenous grafts which some men believe grow. Certainly, some of the cells may grow, but how many and how long they grow is a subject for considerable discussion. How long can a bone be stored? I do not know. We tried to keep a constant supply available and rotate the stock and use-

up the old bone first, and it seems we have a hard time getting any stock, or any deposits in the bank. But we have kept it safely for three or four months. I appreciate Dr. Stinchfield's caution to orthopedic surgeons in general, or general surgeons who are contemplating taking up the use of the bone bank. It is a very apropos remark, and I would say that we should be very careful in doing work in which homogenous bone is used, and proceed carefully. In other words, "Don't rush the bank."

## ANALGESIC EFFECTS IN HUMAN SUBJECTS OF MORPHINE, MEPERIDINE AND METHADON

EUNICE M. CHRISTENSEN, M.D. and E. O. GROSS, M.D.
Iowa City, Iowa

Certain disadvantages of previously known potent analgesics have led investigators to search for new drugs which possess good analgesic properties but lack undesirable side effects. Following World War II knowledge of a new group of compounds prepared by German chemists was disclosed in a report by the United States Department of Commerce.[1] Scott and Chen [2] have recently reported pharmacologic studies of members of this series. They found one of these compounds, methadon (6-dimethylamino-4, 4-diphenyl-3-heptanone), to be outstanding. The following study deals with a comparison of the analgesic properties of this drug[3] with those of morphine and meperidine hydrochloride ("demerol hydrochloride").

The side effects and analgesic properties of methadon in combination with atropine and scopolamine were studied to determine the possible value of methadon as a premedication agent for anesthesia. Because these two agents altered the threshold effect of methadon, similar combinations were used with morphine and meperidine.

Slaughter and Munsell [4] and Floodmark and Wrammer [5] have reported that neostigmine enhanced the analgesic action of the opiates. The analgesic effects of neostigmine alone and in combination with each of the analgesic drugs were tested. Clinical studies were undertaken to evaluate methadon as a preoperative and postoperative analgesic agent.

### PROCEDURE

The analgesic measurements were determined by the Wolff, Hardy, Goodell method,[6] a machine being used which was built by the Experimental Engineering Laboratories. Eleven human volunteer subjects (5 medical students and 6 staff members) were tested. They remained quietly seated during the exposure but were allowed to read or study between the readings. All subjects rested at least ten minutes before normal threshold was determined. The end point used was a sudden "welling up" of pain at the end of the three second exposure. Room temperature was maintained at approximately 24 C. Drafts and excessive humidity were avoided. The finding that normal thresholds were remarkably constant in all subjects and remained so throughout the study is in agreement with the report of Wolff, Hardy and Goodell.[6] Exposures to the light beam were made on the blackened forehead at twenty minute intervals after subcutaneous and at ten minute intervals after intravenous administration of the drugs. The subjects were not informed of the identities of the drugs they received. After some experience, however, they were able to identify each compound or combination of drugs by the side effects. At least one week elapsed between the administration of two doses of the same drug to any subject. All alterations in pain threshold are presented as percentage change from the normal threshold.

### RESULTS

*Laboratory Results.*—Chart 1 shows a representative curve of the effect on the pain threshold of three doses of methadon administered subcutaneously to the same subject. Chart 2 demonstrates a typical set of curves of the variation in response of 7 different subjects to a 2.5 mg. subcutaneous dose of methadon. It was felt that an average curve could represent the analgesic activity of

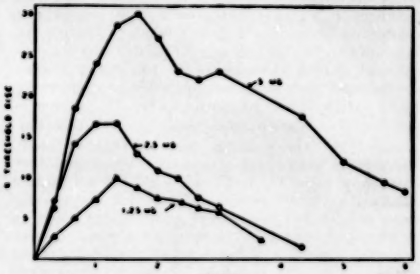


Chart 1.—Effects of subcutaneous injections of methadon on the pain threshold of 1 subject.

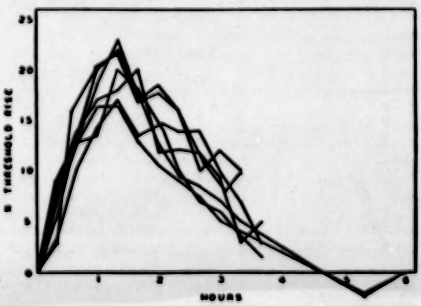


Chart 2.—Variation of pain threshold rises among 7 subjects given the same dose of methadon (2.5 mg.) subcutaneously.

Read before the Section on Anesthesiology at the Ninety-Sixth Annual Session of the American Medical Association, Atlantic City, N. J., June 13, 1947.

From the Division of Anesthesiology and Department of Pharmacology, State University of Iowa.

1. Kleidrer, E. C.; Rice, J. B.; Conquest, V., and Williams, J. H.: Report 981, Department of Commerce, Office of the Publication Board, Washington, D. C.

2. (a) Scott, C. C., and Chen, K. K.: The Action of 1,1-Diphenyl-1-(di-Methylaminoisopropyl)-Butanone-2, a Potent Analgesia Agent, J. Pharmacol. & Exper. Therap. 87: 63-71 (May) 1946. (b) Scott, C. C.; Robbins, E. B., and Chen, K. K.: Comparison of Some New Analgesic Compounds, Science 104: 587-588 (Dec. 20) 1946. (c) Scott, C. C.; Kohlstaedt, K. G., and Chen, K. K.: Comparison of the Pharmacologic Properties of Some New Analgesic Substances, Anesth. & Analg. 26: 13-17 (Jan.-Feb.) 1947.

3. Also called "dolophine," "2c" "amidone" and 10820 of the German series. The methadon was supplied by Abbott Laboratories, North Chicago, Ill.

4. Slaughter, D., and Munsell, D. W.: Some New Aspects of Morphine Action Effects on Pain, J. Pharmacol. & Exper. Therap. 68: 104-112 (Jan.) 1940.

5. Floodmark, S., and Wrammer, T.: The Analgesic Action of Morphine Eserine and Prostigmine, Acta physiol. Scandinav. 9: 88-96, 1945.

6. Hardy, J. D.; Wolff, H. G., and Goodell, H.: A New Method for Measuring Pain Threshold: Observations on Spatial Summation of Pain, J. Clin. Investigation 19: 649-657 (July) 1940.

each drug. Average threshold curves at three dose levels are presented in charts 3, 4 and 5 for each of the drugs when given subcutaneously. When the three drugs were

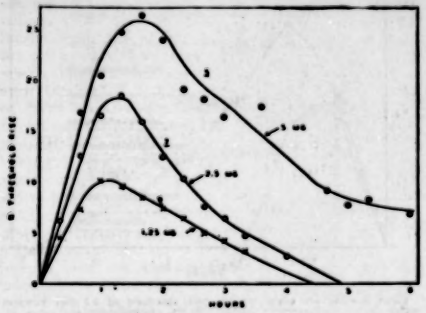


Chart 3.—Average effects on the pain threshold of varying doses of methadon injected subcutaneously. Underlined figures indicate the numbers of subjects used in obtaining the curves.

administered intravenously a somewhat greater variation in response of the different subjects was noted. To

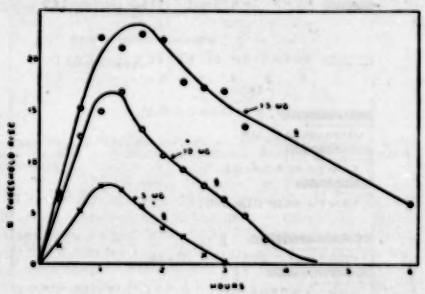


Chart 4.—Average effects on the pain threshold of varying doses of morphine sulfate injected subcutaneously. Underlined figures indicate the numbers of subjects used in obtaining the curves.

conserve space the remaining figures will show only peak threshold rises and total duration of analgesia. The results obtained following subcutaneous and intra-

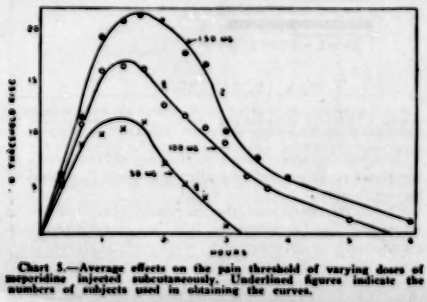


Chart 5.—Average effects on the pain threshold of varying doses of meperidine injected subcutaneously. Underlined figures indicate the numbers of subjects used in obtaining the curves.

venous injections of all three drugs are shown in chart 6. The duration of analgesia of all three drugs following subcutaneous injection is much longer than that following an intravenous dose. Peaks of threshold rise were usually reached in eighty to ninety minutes when the agents were given subcutaneously and in fifteen to twenty minutes after an intravenous injection. These

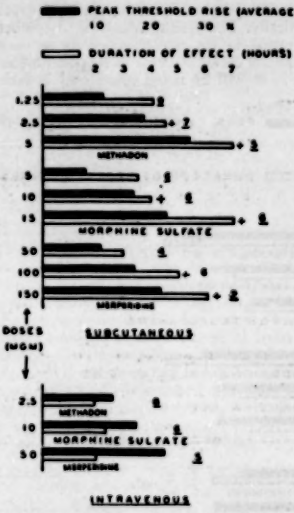


Chart 6.—Average effects on the peak threshold and duration of analgesia are represented for varying doses given subcutaneously and one dose level given intravenously of each analgesic studied.

time intervals agree closely with those of other authors. Methadon appears to be approximately three times as potent as morphine and many times more potent than meperidine when given subcutaneously. This finding agrees with that of Scott and Chen.[2bc] It will be noted that the peak threshold intensity of methadon is less and of meperidine greater when given intravenously as compared to a similar dose subcutaneously. The peak intensity of morphine was about the same for either route of administration. Observations were frequently terminated when pain thresholds had returned to within a few per cent of normal. In all cases in which complete duration was followed the pain thresholds became subnormal for a period. This observation was also made by Pfeiffer and Seevers.[7]

In a few subjects, repeated doses of 1.25 mg. of methadon were administered. The second and third doses were repeated when the threshold was at or near normal. These repeated doses gave threshold rises about equal to the original rise.

Oral doses produced decided variations in both intensity and duration, and no satisfactory comparison could be made. These variations are probably due to different rates of absorption.

Methadon produced only slight sedation when given subcutaneously. On intravenous injections there was rather pronounced sedation for about the first ten minutes. In all instances the degree of sedation was less

Seevers, M. H., and Pfeiffer, C. C.: Study of Analgesia, Subjective Depression and Euphoria Produced by Morphine, Dilaudid and Codeine in Normal Human Subject, J. Pharmacol. & Exper. Therap. 56:166-187 (Feb.) 1936.

than that produced by either morphine or meperidine. Nausea and vomiting were not experienced by any of the subjects. No euphoria was reported by any of the subjects.

Atropine or scopolamine in a 0.3 mg. dose was injected simultaneously with each analgesic agent, because this was the usual minimum preoperative dose used clinically. The results following the subcutaneous administration of the analgesic agents in combination with 0.3 mg. of either atropine or scopolamine are shown in chart 7. It will be noted that in all instances when the combination was given subcutaneously the duration of analgesia was shortened. The peak threshold rises were less when morphine and methadon were combined with atropine or scopolamine but were not greatly altered when the drugs were used with meperidine. When atropine was given subcutaneously to two subjects one-half hour before methadon the intensity and duration of analgesia still remained less than when methadon was given alone. When a 0.3 mg. dose of atropine was injected intravenously forty minutes after a subcutaneous dose of methadon the intensity of the analgesia immediately began to decrease and total duration was greatly shortened from the normal effect of a similar subcutaneous dose of methadon alone (chart 8).

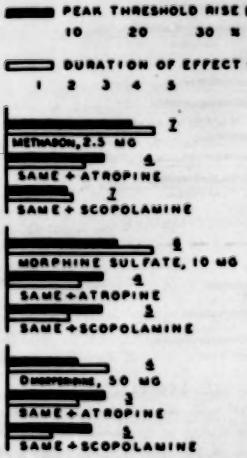


Chart 7.—Average effects of 0.3 mg. of atropine sulfate or scopolamine bromide on the peak threshold and duration of analgesia produced by the subcutaneous injection of the analgesic compounds.

When the three analgesic drugs were administered intravenously with atropine or scopolamine, the only consistent change was a shortening of duration effect of methadon (chart 9).

Undesirable side effects of morphine and meperidine such as nausea and vomiting were absent when either atropine or scopolamine was given with these two agents. The sedative action of scopolamine with these drugs appeared to be additive. The subjects who received methadon in combination with atropine or scopolamine noted only the subjective symptoms of atropine or scopolamine.

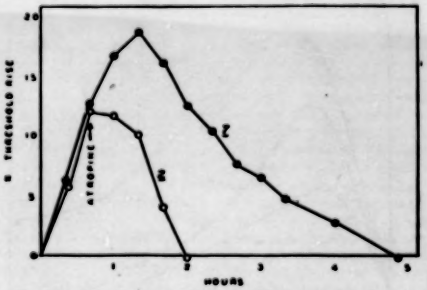


Chart 8.—Average effects on the pain threshold of 0.3 mg. atropine sulfate given intravenously forty minutes after the subcutaneous injection of 2.5 mg. of methadon.

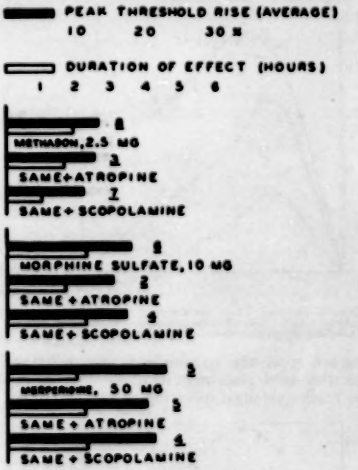


Chart 9.—Average effects of 0.3 mg. of atropine sulfate or scopolamine bromide on the peak threshold and duration of analgesia produced by the intravenous injection of the analgesic compounds.

Atropine or scopolamine in 0.3 mg. subcutaneous or intravenous doses did not alter the pain threshold of three subjects.

Chart 10 represents the increased threshold effect when 0.5 mg. neostigmine was injected either subcutaneously or intravenously with each analgesic drug and when administered alone. The combinations with neostigmine produced greater sedation than did the three analgesics alone. These findings confirm the results of Slaughter and Munsell with the opiates.[8] Contrary to the findings of Slaughter and Munsell [8] but confirm-

ing the results of Floodmark and Wrammer[5] it was found that neostigmine produced considerable rise in pain threshold when it was administered alone.

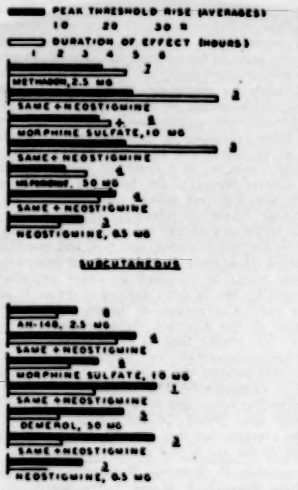


Chart 10.—Average effects of 0.5 mg. of neostigmine sulfate on the peak threshold and duration of analgesia produced by the analgesic compounds.

*Clinical Results.*—Sixty-nine patients, 37 female and 32 male, received methadon as a preanesthetic agent. Their ages ranged from 14 to 77 years. All received 5 mg. of methadon combined with either 0.3 or 0.4 mg. of scopolamine. The majority of the patients received the combination intravenously. In addition 0.06 to 0.2 Gm. of sodium pentobarbital was given to all patients before spinal, regional or local anesthesia.

The anesthetic agents are shown in table 1.

TABLE 1.—*Anesthetic Agent*

| | |
|---|---|
| Cyclopropane | 15 |
| Nitrous Oxide | 40 |
| Ethylene | 6 |
| Ether | 1 |
| Spinal | 3 |
| Caudal | 2 |
| Intercostal block | 1 |
| Field block | 1 |

Administration of methadon, 5 mg., was repeated on an average of once during each operation of over one and a half hours when the anesthetic agent was nitrous oxide.

The majority of the patients who received nitrous oxide had abdominal surgical treatment. As all patients in this group were intubated under intravenous barbiturate and curare, no evaluation of methadon during the induction period was attempted. However, these patients did require larger amounts of "pentothal sodium" for sedation and curare for relaxation than did the control patients premedicated with morphine and scopolamine.

Most of the subjects who received cyclopropane had no prolongation of the induction period. They had as smooth an anesthetic course and as good relaxation as did those premedicated with morphine. All persons premedicated with methadon except those who received a large amount of "pentothal sodium" during surgical treatment were awake and alert when they left the operating room. Most of the subjects premedicated with methadon and scopolamine who had spinal or local anesthesia were apprehensive throughout the operation. It appears that this agent does not produce sufficient sedation for this type of anesthesia. This observation agrees with that of Scott, Livingstone and others.[8]

TABLE 2.—*Undesirable Effects*

| | Cases |
|---|---|
| Difficult to maintain in anesthesia | 5 |
| Excitement stage | 2 |
| Apprehension | 3 |
| Induction time prolonged | 3 |
| Respiratory depression | 4 |
| Blood pressure rise | 1 |

Table 3 shows the postoperative course. Except for 8 patients who received morphine routinely postoperatively, no patient was given an analgesic until he complained of pain. Forty-four of the remaining 61 persons experienced no pain the first twenty-four hours. Four subjects received only partial relief from pain or were classed as dissatisfied. These received 5 mg. every four hours. One of these was an alcoholic addict, and 1 was a known addict who demanded morphine after two doses of methadon because she received "no kick from the shot." One highly emotional person enjoyed the euphoria from opiates and demanded dihydromorphinone hydrochloride. The other patient was only partially relieved by two doses of methadon intramuscularly after a vaginal plastic operation.

TABLE 3.—*Postoperative Course*

| | Cases |
|---|---|
| Nausea | 1 |
| Nausea and vomiting | 1 |
| Respiratory or circulatory depression | 0 |
| Atelectasis | 0 |
| Medication (analgesic) methadon, 5 mg. | |
| 1 dose | 10 |
| 2 doses | 5 |
| 3 doses | 2 |
| Unsatisfactory | 4 |
| No medication (analgesia) first 12 hours | 44 |
| Morphine sulfate by error | 0 |
| Restlessness relieved by methadon | 1 |
| Addict | |
| 1—on methadon | |
| 1—not relieved | |
| Deaths | |
| Superior vena cava cut during operation; cerebral anoxia | 1 |

Eleven additional patients received methadon either orally or intramuscularly for pain from various causes including cancer, tic douloureux, peripheral vascular disease pain, migraine, other headaches and arthritis. Doses varied from 2.5 to 5 mg. every three to four hours.

Six obtained complete relief from pain; 1, an arthritic received no relief with one dose of 2.5 mg. and refused to repeat it. Two had previously received morphine in 10 and 15 mg. doses every four hours from one to two months with complete relief from pain. Methadon was abruptly substituted. Both complained that the "shots had no kick." After twenty-four hours both became satisfied and received complete relief from pain from 5 mg. intramuscularly four to five times a day. Two patients with cancer who were only partially relieved of pain by large doses of morphine and meperidine were also not completely relieved by 5 to 10 mg. of meth-

8. Scott, W. W.; Livingstone, H. M.; Jacoby, J. J., and Broberg, G. G.: Early Clinical Experience with Dolophine (No. 10820), Anesth. & Analg. **26**: 18-20 (Jan.-Feb.) 1947.

adon. A combination of 5 mg. methadon and 0.5 mg. neostigmine afforded 1 of these patients longer relief from pain. The 1 person who was nauseated from 2.5 mg. methadon was also nauseated after an injection of isotonic solution of sodium chloride. Euphoria was noted by 1 subject.

The best analgesia was obtained in cases of postoperative pain. This agrees with the conclusion of Scott, Chen and Kohlstaedt [2c] and Scott, Livingstone and others.[8]

## COMMENT

The fact that intensity and duration of the analgesic action of methadon were markedly shortened by atropine or scopolamine helps explain why methadon was frequently an unsatisfactory premedication agent. This combination of drugs lacked both analgesic and satisfactory sedative properties.

Small doses of methadon afforded good analgesia clinically. Methadon seemed most useful for postoperative pain and for relief of pain from many other causes. Combined with neostigmine it should afford even greater relief for patients who have severe pain.

## SUMMARY

Methadon is an analgesic agent three times as potent as morphine and many times more potent than meperidine. It lacks sedative properties. Undesirable side effects are minimal. It may be administered intravenously for analgesia of rapid onset and short duration or subcutaneously for slower onset and longer analgesic action.

Therapeutic subcutaneous doses of atropine or scopolamine decreased both intensity and duration of the analgesic effects of methadon and morphine as measured by determination of pain threshold. The duration but not the intensity of the analgesic action of meperidine was shortened.

When the analgesic drugs were administered intravenously with atropine or scopolamine, the only consistent change was a shortening of duration effect of methadon.

Atropine and scopolamine produced no analgesia as measured by determinations of pain threshold.

Undesirable side effects of morphine and meperidine were less noticeable when atropine or scopolamine was added. Subjects were more sedated when scopolamine was injected with each analgesic.

Neostigmine increased both intensity and duration of the analgesic action of morphine, meperidine and methadon as measured by determination of pain thresholds.

Premedication agents should be selected for sedative effects rather than for their analgesic actions. Methadon is most useful as an analgesic in postoperative subjects and in cases of pain from many other causes.

Pain threshold studies of 11 subjects were made by the Wolff, Hardy, Goodell technic. Eighty clinical cases are reported.

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## ABSTRACT OF DISCUSSION

DR. LEO V. HAND, Boston: Dr. Christensen's laboratory findings substantiate those of other investigators as to comparative effects on threshold and duration with morphine, meperidine and methadon. Methadon has three times the potency of morphine and approximately thirty times the potency of meperidine. Like meperidine, there is an absence of nausea and vomiting. As to side effects, there seems to be a difference of opinion. Dr. Christensen reports only a slight sedative effect when the drug is administered subcutaneously and no other undesirable side actions. Other investigators report a 50 per cent incidence of lightheadedness or dizziness, but not true vertigo. Also, they report that when large doses are used there is not only respiratory depression but also circulatory changes: fall in blood pressure levels and, in particular, changes in rate and pronounced bradycardia. Forty patients of the 69 had nitrous oxide anesthesia. The majority of these 40 patients had abdominal surgical treatment. These patients who were to have abdominal surgical treatment under nitrous oxide required heavy doses of "pentothal" for intubation and curare for relaxation. If one were to eliminate this group in which nitrous oxide plus "pentothal" was given, one would eliminate approximately 50 to 57 per cent of the patients from evaluation of preanesthetic medication studies, as well as an appreciable period of postoperative medication studies. An opiate or its counterpart should not be used for strictly sedative purposes; the barbituric acid derivatives are more effective. I do not believe that premedication influences an anesthetic course or relaxation of the patient. It is the important factor in a smooth induction. Relaxation is dependent entirely on the administrator and type and quantity of agent administered. How many of these surgical procedures in these 69 patients might be classified as major procedures usually accompanied by two or more days of moderate to severe postoperative pain? Our results on the efficacy of morphine plus neostigmine do not approach those of Dr. Christensen with methadon. She reports that 44 of 61 patients experienced no pain the first postoperative day. In our statistics on 400 patients, we found that patients who received morphine plus neostigmine required an average total dose of 30 mg. of morphine for the first twenty-four hours and 20 mg. of morphine for the second twenty-four hour period. Of the patients receiving morphine alone, the average total dose was 50 mg. the first twenty-four hours and 30 mg. the second twenty-four hours.

DR. BENJAMIN H. ROBBINS, Nashville, Tenn.: From data presented in charts 1, 3, 4 and 5, the degree of analgesia produced by 5, 15 and 150 mg. of methadon, morphine and meperidine, respectively, is about the same. These data place methadon as about three times as active as morphine, which is greater than other reports (Kirchhof, A. C., and David, N. A.: Clinical Trial of a New Synthetic Heptonone Analgesic [Dolophine]: Preliminary Report, West. J. Surg. 55: 183-186 [March] 1947) and our own observations indicate. Our experience with methadon has shown that it may be substituted for morphine or meperidine in a great variety of uses. For preanesthetic medication doses of 7.5 mg. combined with atropine, gave good effects. A smaller dose is not as satisfactory as 10 mg. of morphine. For postoperative pain, a dose of 5 or 7.5 mg. every six hours has been satisfactory in all cases except 2. It has given good relief after gastrectomy, sympathectomy, lobectomy, pneumonectomy, thoracoplasty and less extensive procedures. It controls pain in coronary occlusion and acute rheumatic pericarditis, but the dose has to be increased and repeated more frequently. Three patients who showed sensitivity reactions to opiates, tolerated methadon well. Three patients addicted to morphine, taking 0.250 to 0.6 Gm. daily, were changed to methadon, 7.5 to 10 mg. every four to six hours, without discomfort, and in 2 of these the methadon was gradually withdrawn in five to six days without the development of abstinence signs or symptoms. One meperidine addict, using 30 to 40 cc. per day, 1.5 to 2.25 Gm., was changed to methadon, 20 mg. six times daily for three days, and now is down to two doses daily without signs of meperidine abstinence. These experiences agree with those reported by Isbell and others (Isbell, H.; Walker, A.; Eisenman, A. J., and Frank, K.: Effect of Single Doses of 10820 [4-4 Diphenyl—6-Dimethylamine-Heptonone-3] on Man, Federation Proc. 6: 341 [March] 1947). Reports from the First United States Narcotic Farm indicate that regular and repeated use of methadon may lead to addiction. Psychic effects of methadon are less than with morphine and evidence of physical dependence is less, so it is possible that this substance may not be a true addictive drug. If experience shows that methadon, unlike morphine or meperidine, is free of addiction liabilities, this new substance will be the greatest addition to that list of pain-relieving drugs since the introduction of morphine or its precursor, opium.

DR. JOHN S. LUNDY, Rochester, Minn.: My associates and I have 1 patient who has some euphoria from methadon. He is a physician who has suddenly contracted rheumatoid arthritis and has acute attacks. He gets complete relief with this substance but he gets euphoria from it. He gets no thrill from meperidine or morphine. We have had unfortunate experiences with meperidine. It can be the worst addictive drug that we have used. It is only in rare instances that it is so addictive, but for those persons to whom it gives euphoria it does something for which they would never give it up for anything in this world. We have had several patients now who have come in addicted to morphine and we have started them on methadon. For the first two or three days they say it gives relief from the pain but does not give them any thrill. So far, however, we have had no trouble taking patients off morphine and using methadon. In order to be sure that this is a pain-relieving drug, we have tried it now in a number of cases in which spinal anesthesia has worn off before a hernia operation was completed and we have been able to get fifteen minutes of relief from pain for each 10 mg. given intravenously, for even as many as three doses in order that an operation might be completed. I think that is a definite test for pain relief. There are many things about this drug that are interesting. We gave one man, after a Smithwick operation when he suffered tremendous amount of pain, 28 mg. every four hours for six days, and he finally experienced an over-dose. He looked extremely ill, and the question of damage to the liver came up. All of the tests for damage to the liver that are done in our institution were applied and appeared to be normal as far as liver function was concerned. Our series is not large—I think perhaps 175 cases—but we feel that this drug has potential virtue.

DR. EUNICE CHRISTENSEN, Iowa City, Iowa: The subjects who took 2.5 and 5.0 mg. doses of methadon in the laboratory for investigative purposes experienced some dizziness and lightheadedness occasionally after subcutaneous injection, and more frequently for a few minutes after the doses were given intravenously. Respiration rates and blood pressure were checked before and every fifteen to twenty minutes after administration of 1.25 to 5.0 mg. doses of methadon for the duration of analgesia. No significant changes were noted. The majority of the patients who had nitrous oxide anesthesia had bowel or gastric resections, laminectomies, operations on the chest, etc.—procedures after which pain might be expected. The patients in the nitrous oxide group who were premedicated with methadon probably needed more "peutothal" than those who received morphine preoperatively because methadon lacked sedative properties. Our series of clinical cases is small. Possibly after we have given methadon to a larger group, we, too, may feel that greater doses are needed in certain cases relieved only partially by 2.5 or 5.0 mg. of methadon. Dr. Robbins asked the reason for the increased pain threshold and duration effect when neostigmine was given with the analgesic agent. We believe this was a summation effect. We do not know why atropine and scopolamine shortened the analgesic effect of the three drugs. That problem is now being studied. Our clinical patient who noted euphoria after methadon did not experience it from morphine or meperidine. One of the laboratory subjects for the pain threshold tests had pronounced euphoria after both meperidine and morphine injections. He disliked methadon because it didn't give him a "kick."

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**Ascites.—There are three important physiopathologic states which lead to the formation of ascites. The first and most frequently observed one is cirrhosis of the liver. The second cause is the implantation of a malignant neoplasm of the peritoneum usually secondary to carcinoma of the gastrointestinal tract or the ovary, but occasionally the neoplasm is primary such as a mesothelioma. Thirdly, cirrhosis of the liver due to repeated and long-standing congestive heart failure may lead to ascites.—Lord, J. W., Jr., from an address given April 29 at the Clinical Research Meeting of the New York Academy of Medicine, New York.**

# FATAL TOXIC ENCEPHALOPATHY APPARENTLY CAUSED BY STREPTOMYCIN

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Few fatal complications of streptomycin therapy have been reported in the medical literature.[1] However, it is well recognized that streptomycin produces dysfunction of the eighth cranial nerve in man [2] and that its administration is sometimes followed by symptoms which are best explained by the assumption that temporary damage to nervous or vascular tissue has occurred. Thus, paresthesias of the hands, the tongue and the circumoral region are not uncommon.[3] Furthermore, there is on record at least one report of convulsions having occurred during the administration of streptomycin intravenously.[4] We have recently witnessed a case of fatal encephalopathy which we believe was caused by streptomycin. The observations may throw some light on the nature of the nervous manifestations of streptomycin intoxication and on the relation of renal function to blood levels of the drug.

## REPORT OF CASE

The patient was a white married woman aged 25. She had had diabetes since the age of 6, but had controlled it adequately by the use of diet and insulin.

Her present illness began in April 1946, when albuminuria and pyuria were detected by an obstetrician, in the second month of pregnancy. The pregnancy was terminated and the fallopian tubes ligated in June 1946, after the pyelonephritis had persisted and poor renal function had been demonstrated. Postoperatively a wound infection appeared and drained for several weeks. During this time she suffered from intermittent lumbar pain and fever, which recurred after her discharge from the hospital, necessitating her readmission. A third admission, for ten days, was required for another exacerbation of the infection of the urinary tract. Penicillin and sulfonamide compound were administered during each of these hospitalizations.

During the two month interval between her third and fourth (last) admissions, she suffered from frequent lumbar pain and from crops of small furuncles. She lost 28 pounds (12.7 Kg.) in weight.

On her final admission,[5] Oct. 4, 1946, physical examination showed a well developed but thin and pale young woman, not in acute distress. The temperature was 99.4 F., the pulse rate 120, the respirations 24 and the blood pressure 140 systolic and 90 diastolic. An acneiform pustular eruption was noted over the face and upper anterior part of the chest. The ocular fundi were normal, and abnormalities were not noted in the heart and lungs. Tenderness was noted in both costovertebral angles and in both lower quadrants of the abdomen, but no masses or organs were palpated. Pelvic examination was not done.

The laboratory findings on admission were as follows: The red blood cell count was 3,300,000; hemoglobin, 8.7 Gm.; white blood cell count, 19,000; differential count: stab forms 7 per cent, polymorphonuclear leukocytes 82 per cent, lymphocytes 10 per cent and monocytes 1 per cent. Urine: The specific gravity was 1.015; albumin, 4 plus; sugar, 4 plus; acetone, absent; microscopic examination: there were many white blood

From the Department of Medicine of the Bethesda Hospital and the Department of Internal Medicine, College of Medicine, University of Cincinnati.

1. McDermott, W.: The Toxicity of Streptomycin, Am. J. Med. **2**: 491-500 (May) 1947.

2. Brown, H. A., and Hinshaw, C.: Toxic Reaction to Streptomycin on the Eighth Nerve Apparatus, Proc. Staff Meet., Mayo Clin. **21**: 227-232 (Sept. 4) 1946.

3. Streptomycin in the Treatment of Infections: A Report of One Thousand Cases, Committee on Chemotherapeutics and Other Agents, National Research Council, J. A. M. A. **132**: 70-77 (Sept. 14) 1946.

4. Finland, M.; Murray, R.; Harris, H. W.; Kilham, L., and Meads, M.: Development of Streptomycin Resistance During Treatment, J. A. M. A. **132**: 16-21 (Sept. 7) 1946.

5. The three previous admissions were to hospitals other than that of the final admission.

cells in clumps and red blood cells, but no casts. Blood sugar was 580 mg. per hundred cubic centimeters, the carbon dioxide-combining power 48 volumes per cent and the urea nitrogen 47 mg. per hundred cubic centimeters. A hemolytic Staphylococcus aureus was isolated from the urine and from a pustule on the forehead.

*Course in Hospital.*—The initial period in the hospital was characterized by fever, pyuria and costovertebral pain. The patient presented several problems in management, in addition to the active pyelonephritis. The diabetes was difficult to stabilize because of variations in food and fluid intake related to situations of emotional stress. By means of a diet high in carbohydrates and parenteral supplementation of fluids and dextrose, together with 10 to 40 units of regular insulin and 20 to 40 units of protamine zinc insulin a day, the diabetes was fairly well controlled. At no time did ketosis develop. The blood urea nitrogen level, which was initially 47 mg. per hundred cubic centimeters, slowly fell to normal after nine days of forced fluids, the delayed fall indicating a pronounced restriction of renal function.

The patient received 240,000 units of penicillin daily for the first four days and then 600,000 units daily for the next six days. At this time she was afebrile, but manifestations of active pyelonephritis continued and the urine culture remained positive for staphylococci. The furuncles did not heal. Because of the persistence of white blood cells and staphylococci in the urine, the sensitivity of the micro-organisms to penicillin and streptomycin was tested. Serial dilution technics were employed, the streptomycin tests in tryptone broth, and the penicillin tests in yeast beef broth. The results are shown in table 1.

TABLE 1.—*Sensitivity of Staphylococci to Penicillin and Streptomycin*

| | Penicillin, Oxford Units/Cc. Required to Inhibit Growth | Streptomycin, Micrograms/Cc. Required to Inhibit Growth |
|---|---|---|
| Staphylococcus from boil | 0.4 | 1.5 |
| Staphylococcus from urine | >25 | 1.5 |

Because of the resistance of the organism in the urine to penicillin and its sensitivity to streptomycin, penicillin was discontinued and streptomycin was started in doses of 400 mg. every three hours, on the eleventh hospital day. Within two days the pus had disappeared from the urine and the urine culture was negative. At this time the patient presented no complaints or problems, and was able to be up and about. A new batch of streptomycin was started on the third day of treatment. That day she complained of headache. On the fourth day of treatment, she noticed paresthesias of the face (circumoral), tongue and fingers.

On the fifth day, while talking to her husband, she suddenly became disoriented and began to exhibit athetoid and choreiform movements of the head and all extremities. Streptomycin was discontinued; the total dose had been 15.6 Gm. in five days. The temperature, pulse, respirations and blood pressure at that time were normal. The blood urea nitrogen was 21 mg. per hundred cubic centimeters, the blood sugar 320 mg. per hundred cubic centimeters, the carbon dioxide-combining power 50 volumes per cent and the cerebrospinal fluid normal as to pressure, cytology and protein content. The temperature rose rapidly to 106 F.; the pulse rate reached 128. The respirations gradually became faster, being 40 per minute until Cheyne-Stokes breathing began. The blood pressure, which was normal at the onset of the toxic reaction, rose to 195 systolic and 125 diastolic several hours before death. The patient lapsed into a coma, suffered numerous generalized convulsions, and died at 6:25 p. m., Oct. 21, 1946.

The level of streptomycin in the serum and urine was determined at frequent intervals, and that of cerebrospinal fluid once, by a modification of the method of Price, Nielsen and Welch.[6] The results are presented in table 2.

6. Price, C. W.; Nielsen, J. K., and Welch, H.: The Estimation of Streptomycin in Body Fluids, Science **103**: 36-37 (Jan. 11) 1946.

TABLE 2.—*Levels of Streptomycin in Serum, Urine and Spinal Fluid, Micrograms per Cubic Centimeter*

| Date, 1946 | Blood | Urine | Cerebrospinal Fluid |
|---|---|---|---|
| October 15 | 256 | 160 | .. |
| October 16 | 256 | 320 | .. |
| October 17 | 256 | 160 | .. |
| October 18 | Streptomycin discontinued | | |
| October 20 | 20 | ... | 25 |
| October 21 | 25 | ... | .. |

The clinical diagnoses were juvenile diabetes mellitus, diabetic vascular disease, acute and chronic pyelonephritis, abscesses (Staphylococcus) of kidneys and skin, and terminal toxic encephalopathy due to streptomycin.

An autopsy was performed five hours post mortem by Dr. Edward A. Gall.[7] The significant findings were confined to the peritoneal cavity, the pancreas, the kidneys and the brain, which are described in the following paragraphs. All other organs were normal.

*Peritoneal Cavity.*—There was no free fluid. The omentum and loops of the ileum were bound in the lower part of the abdomen to the right posterolateral surface of the uterus and to the under surface of the abdominal scar. Blunt dissection in this region revealed a multiloculated abscess cavity proceeding from the right adnexa and containing approximately 30 cc. of creamy, yellowish odorless pus. Culture of this showed hemolytic Staph. aureus. This cavity was well walled off, and the posterior surface of the bladder was adherent to it by fibrinous strands.

*Pancreas.*—Gross Examination: This organ was decidedly atrophied, comprising only about one-fourth its normal bulk. There was considerable fibrosis, but lobulation was retained. The parenchymatous components were markedly attenuated.

Microscopic Examination: Despite the gross impression of atrophy, abundant parenchyma persisted. There were, however, only rare islets, and these showed much attenuation.

*Kidneys.*—Gross Examination: The kidneys weighed together 220 Gm., and were roughly symmetric. There was moderate edema of the perirenal fat which adhered unduly to the true capsule. The latter stripped with ease and revealed an irregular mottled yellowish red surface. On section there were several cortical cystic abscesses measuring up to 0.8 cm., containing yellowish gray purulent fluid. The cortex was narrowed to 3 mm., and there were many minute bright yellow foci of necrosis with streaklike appearance. These were distributed predominantly among the pyramids, and several of the latter showed frank dissociation. The pelves were not dilated, nor was the mucosa significantly injected.

Microscopic Examination: All sections showed a severe degree of pyelonephritis of chronic character with focal tubular atrophy, interstitial inflammation and glomerular hyalinization. Many large vessels exhibited considerable arteriosclerosis. Where not atrophied the majority of the proximal tubules showed swollen, vacuolated and granular cytoplasm. The lumens were obtruded on and the picture was that of hydropic swelling. Glomeruli exhibited considerable intercapillary sclerosis, and a few contained "hyalin ball-like deposits." A peculiar autolytic necrosis of several pyramids was noted, and in these there appeared to be some calcification. The pelvic mucosa elsewhere showed chronic inflammation and edema.

*Brain.*—Gross Examination: The brain, except for a slight flattening of the gyri, was grossly normal. The vessels at the base were thin walled and normally distributed. Coronal sections through both hemispheres revealed a moderate degree of swelling of the white matter and a diffuse congestion, especially pronounced throughout the cortical gray substance (fig. 1).

Microscopic Examination: Survey sections were taken from various regions of the gray and white matter of both hemispheres, from the hypothalamus and the medulla. The microscopic examination disclosed two principal types of changes: (1) vascular alterations and (2) lesions of the nervous tissue proper.

7. Pathologist, Bethesda Hospital.

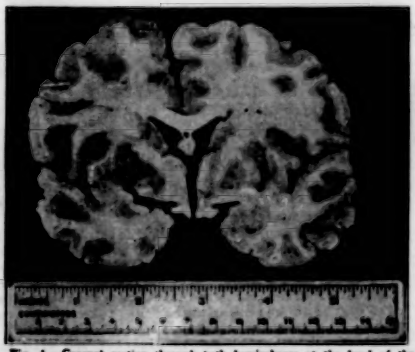

Fig. 1.—Coronal section through both hemispheres at the level of the optic chiasm. Note the enlargement of the white matter of both hemispheres associated with compression of the lateral ventricles.

The vascular changes were of uniform character, varying only in degree, and were confined chiefly to the cerebral white matter, basal ganglions and medulla. The changes consisted of a tremendous distention of the smaller veins and capillaries and of signs of stasis and vasoparalysis (fig. 2). Some of the perivascular spaces appeared distended and harbored serous fluid, extravasated red blood cells and macrophages. Some of the veins showed signs of beginning vessel wall necrosis.

Fig. 2.—Vascular alterations of the medulla. Note the tremendous distention of the capillaries. Hematoxylin eosin stain; × 260.

The lesions of the nervous tissue proper consisted of small focal areas of rarefaction and necrosis; early stage of swelling of the white matter; ischemic degeneration of some of the nerve cells, especially pronounced in the areas adjacent to the distended blood vessels. The cytoplasm of some of the nerve cells contained brownish hematogenous pigment.

Sections taken from the hypothalamus disclosed a few petechial hemorrhages involving the nucleus paraventricularis and the nucleus supraopticus. The neuronal elements, however, appeared only slightly damaged.

In sections taken from the medulla there were numerous distended capillaries and veins with changes characteristic of vasoparalysis. In addition, there were a few focal areas of tissue rarefaction in which some of the nerve cells displayed signs of a far advanced ischemic degeneration.

The cranial nerves, including the eighth nerve, did not reveal any pathologic abnormalities.

The leptomeninges were moderately distended and harbored a few red blood cells and macrophages.

The final neuropathologic diagnoses were: functional vascular disturbances of the white matter, medulla and basal ganglions characteristic of vasoparalysis, associated with secondary cerebral swelling and ischemic alterations of the nerve cells of the nuclei and of the cortical gray matter; petechial hemorrhages in the paraventricular and supraoptic nuclei of the hypothalamus.

*Summary on the Lesions of the Central Nervous System and General Comment.*—The most striking changes consisted of vascular alterations described as central vasoparalysis.[8] Vascular changes of the same type have been observed repeatedly in cases of brain injury [9] in arsphenamine encephalopathy [10] and other toxic encephalopathies.

There is little doubt that the described alterations of the nervous tissue are secondary to the vascular changes. Whereas in the other examples of central vasoparalysis [11] the circulatory disturbances were chiefly confined to the white matter, in the present case the vascular changes were also found in the hypothalamus, basal ganglions and the medulla. It is conceivable that the involvement of the medulla contributed to the rapid fatal outcome of the present case.

The final pathologic diagnoses were: (1) functional vascular disturbances of the white matter, medulla (early stage of vasoparalysis) and basal ganglions with secondary cerebral swelling and ischemic alterations of the nerve cells of the nuclei and of the cortical gray matter; petechial hemorrhages in the paraventricular and supraoptic nuclei of the hypothalamus; (2) pyelonephritis, acute and chronic with formation of miliary abscesses and acute necrotizing papillitis; (3) intercapillary glomerulosclerosis; (4) nephritis, chronic vascular, severe; (5) toxic nephrosis, with hydropic degeneration of renal tubules, and (6) acute suppurative salpingo-oophoritis with abscess formation on the right side.

## COMMENT

It seemed probable that the events leading to the death of this young woman represented an encephalopathy caused by streptomycin, the symptoms of which appeared with dramatic suddenness on the fifth day of treatment. Three days later the patient was dead. The clinical picture was not that of uremia, diabetic ketosis or insulin shock, and the laboratory studies did not reveal changes characteristic of these conditions. Furthermore, the patient's course up to the time of development of the encephalopathy had been one of improvement, both of the staphylococcic infection of the kidneys and skin and in the stability of the diabetes. The cutaneous lesions were healing, the temperature had subsided, the urine culture had become negative, and the pyuria had diminished. In the face of this general clinical improvement, the sudden appearance of choreiform movements, respiratory irregularities, hyperpyrexia and hypertension suggested the presence of a lesion in the brain stem and the hypothalamus. This clinical impression was largely corroborated by the postmortem examination of the brain. There is little possibility that the toxic reaction could have been caused by drugs other than streptomycin, for all other therapy was discontinued at the time that streptomycin was administered.

8. Scheinker, I. M.: Vasoparalysis of Central Nervous System, a Characteristic Vascular Syndrome; Significance in the Pathology of the Central Nervous System, Arch. Neurol. & Psychiat. **52**:43-56 (July) 1944.

9. Scheinker, I. M.: Neuropathology in Its Clinicopathologic Aspects, Springfield, Ill., Charles C Thomas, Publisher, 1947.

10. Scheinker, I. M.: Genesis of Encephalopathy Due to Arsphenamine (Central Vasoparalysis Due to Arsphenamine), Arch. Path. **37**:91-98 (Feb.) 1944.

11. Footnotes 8, 9 and 10.

The tremendous distention of the veins of the medulla and the small focal necroses in the nerve tissue of the medulla itself point strongly to the action of an exogenous poison which probably damaged vital centers. Furthermore, the involvement of the cortex and the basal ganglions provides an explanation of the choreiform and athetoid movements which ushered in the encephalopathy. Finally, lesions were found in the hypothalamus which may have been the cause of the hyperthermia from which the patient suffered during the last two days of her life.

The levels of streptomycin in this patient's serum were higher than any which have been recorded in our laboratory, namely 256 micrograms per cubic centimeter. Though even higher blood levels have been noted by others[12] without the appearance of cerebral symptoms, comparisons between various laboratories of levels determined by biologic methods are not strictly applicable. Cerebrospinal fluid from our patient was not examined during the administration of streptomycin, but a specimen obtained twenty-four hours after the drug was discontinued contained 25 micrograms per cubic centimeter, or 50 per cent of the blood level at that time. An assay of tissue from the brain performed by Dr. Joseph Tamura revealed no streptomycin. The significance of this finding is not clear. The explanation for the unusually high levels of streptomycin in the blood would appear to lie in the pronounced limitation of renal function which this patient exhibited clinically and indicates the necessity for the careful regulation of dosage in patients with restricted renal function.

The possibility exists that the encephalopathy may have been caused by impurities in the second batch of streptomycin, following administration of which the reaction occurred. However, the facts that central nervous lesions, particularly those involving the function of the eighth nerve, are recognized complications of the administration of streptomycin and that usually high levels of streptomycin were observed in this case suggest that the cerebral lesions were caused specifically by streptomycin.

SUMMARY

A case of fatal toxic encephalopathy, believed to be due to streptomycin, is reported. The reaction consisted of the sudden appearance of disorientation and choreiform and athetoid movements on the fifth day of treatment. These gave way to generalized convulsions, which were accompanied by rapidly appearing hyperpyrexia, tachycardia, arterial hypertension and Cheyne-Stokes respiration. Usually high levels of streptomycin were found in the blood and cerebrospinal fluid, apparently because of poor renal clearance of the drug. The presence of lesions in the brain proper suggest that the nervous manifestations of streptomycin intoxication in this case were central in origin.

12. Finland and others: Buggs, C. W.; Pilling, M. A.; Bronstein, B., and Hirshfield, J. W.: The Absorption, Distribution and Excretion of Streptomycin in Man, J. Clin. Investigation 25:94-102 (Jan.) 1946.

**Testosterone is essential for the growth and maintenance of the entire genital system apart from the interstitial cells themselves. This probably includes the tubules. It certainly includes the vas deferens, prostate, seminal vesicles, accessory urethral glands, penis and scrotum.—McCullagh, E. Perry, Bulletin of the New York Academy of Medicine, June 1948.**

## Council on Physical Medicine

*The Council on Physical Medicine has authorized publication of the following reports.* HOWARD A. CARTER, *Secretary.*

### MEDIQUARTZ GERMICIDIAL ULTRAVIOLET LAMP ACCEPTABLE

**Manufacturer: Medical Quartz Products Company, Subsidiary of Dallons Laboratories, 5955 Santa Monica Boulevard, Los Angeles 27.**

**The Mediquartz Germicidal Ultraviolet Lamp, Model 999, is a device designed to be attached to walls or ceilings and to disseminate ultraviolet radiation over large areas. It is intended for the control of air-borne bacteria and consists of a cold cathode gaseous discharge tube of a new design. The lamp has a tube of special ultraviolet-transmitting glass 1½ mm. in diameter and with an exposed length of about 213 cm. When operated on a line voltage of 110, the lamp consumed 44 watts. At a distance of 12 mm. from the face of the lamp the ultraviolet energy of the lamp in microwatts per square centimeter was found to be 4,500. The intensity of radiation at a distance of 1 meter from the plane of the tube was 64 microwatts per square centimeter. The spectral distribution of the energy between 2483 and 3200 angstroms was as follows:**

| | |
|---|---|
| 87 | per cent between 2,483 and 2,600 angstroms |
| 11 | per cent between 2,600 and 3,000 angstroms |
| 2 | per cent between 3,000 and 3,200 angstroms |

**No lines below 2,482.7 angstroms were detectable; thus, the lamp meets the requirements for acceptance of disinfecting lamps. The Council accepts ultraviolet lamps for disinfecting purposes for use in hospitals, nurseries and operating rooms where the population can be controlled and where the lamps can be expected to reduce the probability of infection by air-borne bacteria. They are not acceptable for use in waiting rooms, school rooms, auditoriums, trains and similar places where persons congregate and move about at will. The Council voted to include the Mediquartz Germicidal Ultraviolet Lamp in its list of accepted devices.**

### THE KIDDE TUBAL INSUFFLATOR ACCEPTABLE

**Manufacturer: Kidde Manufacturing Co., Inc., 35 Farrand Street, Bloomfield, N.J.**

**The Kidde Tubal Insufflator is a device for delivering carbon dioxide in controlled amounts and at controlled pressures into the uterine tubes for diagnostic or therapeutic purposes. The essential part of the apparatus is a gasometer which accomplishes the necessary reduction of pressure and measurement of volume. The whole apparatus is housed compactly in a portable case with a dark gray wrinkle finish. The case measures 48 by 30 by 23 cm. (19 by 12 by 9 inches) and weighs 13.4 Kg. (29 pounds, 10 ounces). The shipping weight is 18 Kg. (40 pounds). The motor actuating the kymograph draws 10 watts on a 110-115 volt alternating current. Included in the unit price of the instrument are (1) five metal refill cartridges of carbon dioxide, (2) one hundred kymograph patient-recording charts, (3) rubber tubing, (4) a bottle of recording ink and (5) a cannula. A valveless oil attachment to hold opaque medium for roentgenologic work is available as an accessory but is not included in the price of the unit.**

# MEDICAL LICENSURE STATISTICS FOR 1947

## FORTY-SIXTH ANNUAL PRESENTATION OF LICENSURE STATISTICS BY THE COUNCIL ON MEDICAL EDUCATION AND HOSPITALS OF THE AMERICAN MEDICAL ASSOCIATION

Donald G. Anderson, M.D., Secretary, and Anne Tipner

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This forty-sixth annual compilation of medical licensure and allied statistics by the Council on Medical Education and Hospitals covers the calendar year 1947 and includes data regarding *(a)* medical examining and licensing boards of the United States and the territories and possessions of the United States, *(b)* boards of examiners in the basic sciences, *(c)* the National Board of Medical Examiners and *(d)* examining boards in the medical specialties.

The official reports which form the basis for these compilations have been contributed throughout the year by the medical licensing boards of all the states, the District of Columbia, Alaska, Hawaii, Puerto Rico and the Virgin Islands; the nineteen boards of examiners in the basic sciences; the sixteen approved examining boards in the medical specialties; the National Board of Medical examiners, and the homeopathic medical licensing boards of Connecticut, Delaware and Maryland. The homeopathic and eclectic examining boards in Arkansas and the homeopathic board in Louisiana did not examine or license any one during the year. No physicians were registered for civilian practice in the Canal Zone.

The cooperation of the officers of the foregoing boards in making possible the vast amount of reliable information presented in the following pages has been invaluable. The Council and THE JOURNAL express their appreciation to those who have supplied these data and for other records furnished throughout the year to the office of the Council.

The tables referring to medical licensing boards include figures for the number of candidates examined for medical licensure in 1947, the numbers licensed and those who secured their first medical license in 1947 and therefore represent additions to the medical profession. There are also included other pertinent data pertaining to the regulations for medical licensure.

TABLE 1.--*Licenses Issued, 1947*

| | Examination | On the Basis of Reciprocity and Endorsement | Total |
|---|---|---|---|
| Alabama | 44 | 113 | 157 |
| Arizona | 19 | 84 | 103 |
| Arkansas | 54 | 38 | 92 |
| California | 540 | 1,328 | 1,868 |
| Colorado | 95 | 88 | 183 |
| Connecticut | 52 | 200 | 252 |
| Delaware | 18 | 6 | 24 |
| District of Columbia | 40 | 216 | 256 |
| Florida | 326 | 0 | 326 |
| Georgia | 129 | 69 | 198 |
| Idaho | 62 | 9 | 71 |
| Illinois | 633 | 271 | 904 |
| Indiana | 111 | 153 | 264 |
| Iowa | 94 | 112 | 206 |
| Kansas | 86 | 64 | 150 |
| Kentucky | 172 | 65 | 237 |
| Louisiana | 225 | 100 | 325 |
| Maine | 31 | 42 | 73 |
| Maryland | 210 | 144 | 354 |
| Massachusetts | 92 | 370 | 462 |
| Michigan | 151 | 227 | 378 |
| Minnesota | 302 | 118 | 420 |
| Mississippi | 59 | 60 | 119 |
| Missouri | 265 | 150 | 415 |
| Montana | 8 | 52 | 60 |
| Nebraska | 87 | 38 | 125 |
| Nevada | 8 | 11 | 19 |
| New Hampshire | 10 | 77 | 87 |
| New Jersey | 89 | 289 | 378 |
| New Mexico | 1 | 65 | 66 |
| New York | 610 | 1,035 | 1,645 |
| North Carolina | 113 | 223 | 223 |
| North Dakota | 25 | 38 | 29 |
| Ohio | 327 | 307 | 634 |
| Oklahoma | 74 | 50 | 124 |
| Oregon | 81 | 119 | 200 |
| Pennsylvania | 440 | 210 | 650 |
| Rhode Island | 34 | 19 | 53 |
| South Carolina | 55 | 40 | 95 |
| South Dakota | 18 | 35 | 53 |
| Tennessee | 136 | 55 | 191 |
| Texas | 282 | 336 | 618 |
| Utah | 42 | 23 | 65 |
| Vermont | 13 | 40 | 53 |
| Virginia | 130 | 136 | 266 |
| Washington | 116 | 185 | 301 |
| West Virginia | 40 | 59 | 99 |
| Wisconsin | 143 | 154 | 297 |
| Wyoming | 0 | 20 | 20 |
| Alaska, Hawaii, Puerto Rico & Virgin Islands | 55 | 49 | 104 |
| Totals | 6,747 | 7,682 | 14,429 |

## Table 2.—CANDIDATES EXAMINED BY

| Regional Numbers | SCHOOL | 1 Alabama | 2 Arizona | 3 Arkansas | 4 California | 5 Colorado | 6 Connecticut | 7 Delaware | 8 Dist. of Columbia | 9 Florida | 10 Georgia | 11 Idaho | 12 Illinois | 13 Indiana | 14 Iowa | 15 Kansas | 16 Kentucky | 17 Louisiana | 18 Maine | 19 Maryland | 20 Massachusetts | 21 Michigan | 22 Minnesota | 23 Mississippi | 24 Missouri | Regional Numbers |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | P F | P F | P F | P F | P F | P F | P F | P F | P F | P F | P F | P F | P F | P F | P F | P F | P F | P F | P F | P F | P F | P F | P F | P F | |
| | ALABAMA | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Med. Col. of Alabama | 69 0 | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | 48 .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | 1 |
| | ARKANSAS | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | Univ. of Arkansas | .. .. | .. .. | 69 0 | 10 .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | 20 .. | .. .. | .. .. | .. .. | .. .. | 10 .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | 10 0 | 2 |
| | CALIFORNIA | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | Col. of Med. Evangelists | .. 11 .. | .. .. | 86 0 | .. .. | .. .. | .. .. | .. .. | .. .. | 30 .. | 30 .. | .. .. | 10 .. | .. .. | .. .. | .. .. | .. .. | .. 10 | 20 .. | .. 10 | 20 20 | .. 16 | 3 |
| 4 | Stanford Univ. | 10 11 .. | .. .. | 61 0 | 10 .. | .. .. | .. .. | .. .. | .. .. | 10 .. | 10 .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | 10 .. | .. .. | 10 .. | 10 .. | .. .. | .. .. | .. .. | 4 |
| 5 | Univ. of California | 10 11 .. | .. .. | 63 0 | 10 .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | 10 .. | .. .. | .. .. | .. .. | .. .. | 5 |
| 6 | Univ. of Southern California | .. 10 .. | .. .. | 71 0 | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | 10 .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | 6 |
| | COLORADO | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | Univ. of Colorado | .. .. | .. .. | .. 10 | 52 0 | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | 10 .. | 10 .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | 7 |
| | CONNECTICUT | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | Yale Univ. | .. .. | .. .. | .. 10 | .. 31 | .. .. | .. .. | .. .. | .. .. | 20 .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | 20 .. | .. .. | 10 .. | .. .. | .. .. | .. .. | .. .. | .. .. | 8 |
| | DISTRICT OF COLUMBIA | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | George Washington Univ. | 30 .. | .. .. | 60 .. | .. .. | .. .. | .. .. | 60 | 31 | 10 .. | 10 .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | 10 .. | .. .. | 30 .. | .. .. | .. .. | .. .. | .. .. | 9 |
| 10 | Georgetown Univ. | .. .. | .. .. | 20 .. | .. 10 | .. .. | .. .. | 60 | 50 .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | 10 |
| 11 | Howard Univ. | .. .. | .. .. | 10 .. | .. .. | .. .. | .. .. | .. .. | 60 .. | 10 .. | .. .. | .. .. | 0 0 | .. .. | .. .. | .. .. | 10 .. | 20 .. | 20 .. | 40 .. | 0 0 | 20 .. | .. .. | 20 0 | 0 | 11 |
| | GEORGIA | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | Emory Univ. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | 32 | 1 33 | 0 .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | 12 |
| 13 | Univ. of Georgia | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | 32 | 1 66 | 0 .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | 13 |
| | ILLINOIS | | | | | | | | | | | | | | | | | | | | | | | | | |
| 14 | Loyola Univ. | .. .. | .. .. | .. 70 | .. .. | .. .. | .. .. | .. .. | .. .. | 70 .. | .. .. | .. .. | 61 0 | 10 10 | 10 .. | .. .. | .. .. | 10 .. | .. .. | .. .. | 20 40 | .. .. | .. .. | .. .. | .. .. | 14 |
| 15 | Northwestern Univ. | 30 10 .. | .. .. | 120 20 | 10 .. | .. .. | .. .. | .. .. | .. .. | 10 10 | 0 0 | 0 0 | 126 0 | 0 2 | 20 30 | .. .. | .. .. | .. .. | .. .. | 30 50 | 110 20 | 30 10 | .. .. | .. .. | .. .. | 15 |
| 16 | Univ. of Chicago | .. .. | .. .. | 40 10 | .. .. | .. .. | .. .. | .. .. | .. .. | 10 .. | .. .. | .. .. | 40 .. | .. .. | 10 10 | .. .. | .. .. | 10 10 | 10 .. | 30 .. | 30 .. | .. .. | .. .. | .. .. | .. .. | 16 |
| 17 | Univ. of Illinois | 20 30 .. | .. .. | 170 | 10 .. | .. .. | .. .. | .. .. | .. .. | 20 .. | .. 20 | 0 0 | 230 0 | 10 .. | 10 .. | .. .. | .. .. | .. .. | 10 .. | .. .. | 30 .. | .. .. | .. .. | .. .. | .. .. | 17 |
| | INDIANA | | | | | | | | | | | | | | | | | | | | | | | | | |
| 18 | Indiana Univ. | .. 20 .. | .. .. | 20 .. | .. .. | .. .. | .. .. | .. .. | .. .. | 52 .. | 10 .. | .. .. | 93 6 | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | 10 .. | .. .. | 80 .. | .. .. | .. .. | .. .. | 18 |
| | IOWA | | | | | | | | | | | | | | | | | | | | | | | | | |
| 19 | State Univ. of Iowa | .. 11 .. | .. .. | 30 10 | .. .. | .. .. | .. .. | .. .. | .. .. | 21 .. | 20 .. | .. .. | .. .. | .. .. | 30 6 | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | 10 20 | .. .. | .. .. | .. .. | 19 |
| | KANSAS | | | | | | | | | | | | | | | | | | | | | | | | | |
| 20 | Univ. of Kansas | .. .. | .. .. | 10 .. | .. .. | .. .. | .. .. | 10 | 20 .. | 20 .. | .. .. | .. .. | .. .. | .. .. | .. .. | 72 0 | .. .. | .. .. | .. .. | .. .. | .. .. | 10 .. | .. .. | .. .. | .. .. | 20 |
| | KENTUCKY | | | | | | | | | | | | | | | | | | | | | | | | | |
| 21 | Univ. of Louisville | .. .. | .. .. | 10 .. | .. .. | .. .. | .. .. | .. .. | 80 | .. 10 | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | 83 0 | 20 .. | .. .. | 10 10 | 10 10 | .. .. | .. .. | .. .. | .. .. | 21 |
| | LOUISIANA | | | | | | | | | | | | | | | | | | | | | | | | | |
| 22 | Louisiana State Univ. | .. .. | .. .. | .. .. | .. .. | 10 .. | .. .. | .. .. | 70 | .. 10 | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | 71 0 | .. .. | 10 .. | .. .. | 30 .. | .. .. | .. .. | .. .. | 22 |
| 23 | Tulane Univ. of Louisiana | 10 10 .. | .. .. | 10 .. | .. .. | .. .. | .. .. | .. .. | 100 | .. .. | .. .. | .. .. | 30 .. | .. .. | .. .. | .. .. | .. .. | 117 0 | .. .. | 10 .. | 70 .. | .. .. | .. .. | .. .. | .. .. | 23 |
| | MARYLAND | | | | | | | | | | | | | | | | | | | | | | | | | |
| 24 | Johns Hopkins Univ. | 10 .. | .. .. | 10 .. | .. 10 | .. .. | 10 | 10 | 40 | 10 20 | .. .. | .. .. | 10 .. | .. .. | 10 .. | .. .. | .. .. | .. .. | 60 0 | 10 .. | .. 10 | .. .. | .. .. | .. .. | .. .. | 24 |
| 25 | Univ. of Maryland | .. .. | .. .. | 30 .. | 10 .. | .. .. | 20 | .. | 30 | .. .. | .. .. | .. .. | 10 .. | .. .. | 10 .. | .. .. | .. .. | .. .. | 70 0 | 10 .. | .. .. | .. .. | .. .. | .. .. | .. .. | 25 |
| | MASSACHUSETTS | | | | | | | | | | | | | | | | | | | | | | | | | |
| 26 | Boston Univ. | .. .. | .. .. | 20 .. | .. .. | .. .. | .. .. | .. .. | .. .. | 10 .. | .. .. | .. .. | 10 .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | 20 .. | .. .. | .. .. | .. .. | .. .. | .. .. | 26 |
| 27 | Harvard Med. Sch. | 10 .. | .. .. | 20 .. | .. .. | .. .. | .. .. | .. .. | .. .. | 10 .. | 10 .. | .. .. | 10 .. | .. .. | 10 .. | .. .. | 10 .. | 10 10 | .. .. | 0 0 | 10 .. | 10 .. | .. .. | 10 .. | .. .. | 27 |
| 28 | Tufts Col. | .. .. | .. .. | 10 .. | .. .. | .. .. | .. .. | .. .. | .. .. | 40 .. | .. .. | .. .. | 10 .. | .. .. | .. .. | .. .. | .. .. | 10 10 | .. .. | 0 0 | 10 .. | .. .. | .. .. | .. .. | .. .. | 28 |
| | MICHIGAN | | | | | | | | | | | | | | | | | | | | | | | | | |
| 29 | Univ. of Michigan | .. .. | .. .. | .. .. | 10 .. | .. .. | 10 .. | .. | 10 | 10 .. | .. .. | 10 .. | 10 .. | .. .. | .. .. | .. .. | .. .. | .. 10 | .. .. | .. 00 | 30 .. | .. .. | .. .. | .. .. | .. .. | 29 |
| 30 | Wayne Univ. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. 50 | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. 00 | 30 .. | .. .. | .. .. | .. .. | .. .. | 30 |
| | MINNESOTA | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31 | Univ. of Minnesota | .. 10 .. | .. .. | 30 10 | .. .. | .. .. | .. .. | .. .. | .. .. | 10 .. | .. .. | .. .. | 50 .. | .. .. | .. .. | .. .. | .. .. | 10 .. | .. .. | .. .. | .. .. | .. .. | 137 0 | .. .. | .. .. | 31 |
| | MISSOURI | | | | | | | | | | | | | | | | | | | | | | | | | |
| 32 | St. Louis Univ. | .. .. | .. .. | 10 0 | 10 .. | .. .. | .. .. | .. .. | .. .. | 20 .. | 20 .. | .. .. | 30 .. | .. .. | .. .. | .. .. | .. .. | 10 .. | .. .. | 1 1 | .. 20 | .. .. | .. .. | 11 0 | 32 | 32 |
| 33 | Washington Univ. | .. 20 .. | .. .. | 10 .. | 10 .. | .. .. | .. .. | .. .. | .. .. | 10 .. | 10 .. | .. .. | 10 .. | .. .. | .. .. | .. .. | .. .. | 30 .. | .. .. | .. .. | 30 10 | 32 0 | .. .. | .. .. | .. .. | 33 |
| | NEBRASKA | | | | | | | | | | | | | | | | | | | | | | | | | |
| 34 | Creighton Univ. | .. 10 10 | .. .. | 70 50 | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | 20 .. | .. .. | 30 .. | .. .. | 120 10 | .. .. | .. .. | .. .. | .. .. | .. .. | 20 .. | .. .. | .. .. | 10 .. | .. .. | 34 |
| 35 | Univ. of Nebraska | .. .. | .. .. | 10 .. | .. .. | .. .. | .. .. | .. .. | .. .. | 10 .. | .. .. | .. .. | 30 .. | .. .. | 20 .. | .. .. | .. .. | .. .. | .. .. | .. .. | 10 .. | .. .. | .. .. | .. .. | .. .. | 35 |
| | NEW YORK | | | | | | | | | | | | | | | | | | | | | | | | | |
| 36 | Albany Med. Col. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | 10 .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | 36 |
| 37 | Columbia Univ. | 10 .. | .. .. | 30 10 | 10 .. | .. .. | .. .. | .. .. | .. .. | 10 .. | .. .. | .. .. | 10 .. | .. .. | .. .. | .. .. | .. .. | 10 .. | .. .. | 10 .. | 10 .. | 30 .. | .. .. | 10 .. | .. .. | 37 |
| 38 | Cornell Univ. | 10 .. | .. .. | 10 .. | 20 .. | .. .. | .. .. | .. .. | .. .. | 10 .. | 10 10 | .. .. | 10 .. | .. .. | .. .. | .. .. | .. .. | 10 .. | .. .. | 0 0 | 10 .. | .. .. | .. .. | 20 .. | .. .. | 38 |
| 39 | Long Island Col. | 20 10 .. | .. .. | .. .. | 30 .. | .. .. | .. .. | .. .. | .. .. | 40 .. | .. .. | .. .. | 10 .. | .. .. | .. .. | .. .. | .. .. | 10 .. | .. .. | 10 .. | .. .. | .. .. | .. .. | .. .. | .. .. | 39 |
| 40 | New York Col. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | 40 .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | 40 |
| 41 | New York Univ. | .. .. | .. .. | 10 .. | .. .. | .. .. | 20 | .. | 20 | 10 .. | .. .. | .. .. | 20 .. | 11 .. | .. .. | .. .. | .. .. | .. 10 | .. .. | 10 .. | .. .. | .. .. | .. .. | .. .. | .. .. | 41 |
| 42 | Syracuse Univ. | .. 10 .. | .. .. | 10 .. | 10 .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | 10 .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | 42 |
| 43 | Univ. of Buffalo | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | 10 .. | .. .. | 10 .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | 43 |
| 44 | Univ. of Rochester | .. .. | .. .. | 20 .. | .. .. | .. .. | .. .. | .. .. | .. .. | 20 .. | .. .. | .. .. | 0 0 | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | 44 |
| | NORTH CAROLINA | | | | | | | | | | | | | | | | | | | | | | | | | |
| 45 | Bowman Gray of Wake Forest | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | 20 .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | 45 |
| 46 | Duke Univ. | .. .. | .. .. | 20 .. | .. .. | .. .. | .. .. | .. .. | .. .. | 01 10 | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | 20 .. | 10 .. | .. 10 | .. .. | 10 .. | .. .. | .. .. | .. .. | 46 |
| | OHIO | | | | | | | | | | | | | | | | | | | | | | | | | |
| 47 | Ohio State Univ. | .. .. | .. .. | 30 .. | .. .. | .. .. | .. .. | .. .. | .. .. | 31 .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | 47 |
| 48 | Univ. of Cincinnati | 10 .. | .. .. | 20 .. | .. .. | .. .. | .. .. | .. .. | .. .. | 40 .. | 10 .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | 48 |
| 49 | Western Reserve Univ. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | 41 .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | 10 .. | 10 .. | 10 .. | .. .. | .. .. | .. .. | 49 |
| | OKLAHOMA | | | | | | | | | | | | | | | | | | | | | | | | | |
| 50 | Univ. of Oklahoma | .. .. | .. .. | 10 .. | 30 .. | .. .. | .. .. | .. .. | .. .. | 11 .. | 10 .. | .. .. | 10 .. | .. .. | .. .. | .. .. | .. .. | 10 .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | 50 |
| | OREGON | | | | | | | | | | | | | | | | | | | | | | | | | |
| 51 | Univ. of Oregon | .. 01 .. | .. .. | 70 .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. 00 | .. .. | .. .. | 30 .. | .. .. | 10 10 | .. .. | .. .. | 40 .. | 40 0 | .. .. | .. .. | 40 .. | .. .. | .. .. | .. .. | 51 |
| | PENNSYLVANIA | | | | | | | | | | | | | | | | | | | | | | | | | |
| 52 | Hahnemann Med. Col. and Hosp. of Philadelphia | 110 .. | .. .. | 120 .. | 30 0 | 0 10 | 40 .. | .. .. | .. .. | .. .. | .. .. | .. .. | 10 .. | .. .. | 10 .. | .. .. | 10 .. | 20 .. | 70 .. | .. 10 | .. .. | .. .. | .. .. | .. .. | .. .. | 52 |
| 53 | Jefferson Med. Col. of Philadelphia | 40 .. | .. .. | 10 .. | 40 0 | 0 .. | 40 .. | .. .. | .. .. | 20 .. | .. .. | .. .. | 10 01 | .. .. | .. .. | .. .. | .. .. | 10 10 | .. .. | 30 .. | 10 .. | 50 40 | .. .. | .. .. | .. .. | 53 |
| 54 | Temple Univ. | .. .. | .. .. | 10 .. | 12 0 | 0 .. | 41 .. | .. .. | .. .. | 20 .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | .. .. | 10 .. | 20 .. | .. .. | .. .. | .. .. | .. .. | 54 |
| | | 1 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | | |

P—Passed, F—Failed.

## MEDICAL EXAMINING BOARDS, 1947

| Medical Number | Montana | Nebraska | Nevada | New Hampshire | New Jersey | New Mexico | New York | North Carolina | North Dakota | Ohio | Oklahoma | Oregon | Pennsylvania | Rhode Island | South Carolina | South Dakota | Tennessee | Texas | Utah | Vermont | Virginia | Washington | West Virginia | Wisconsin | Wyoming | Alaska, Hawaii and Puerto Rico | Totals | Total-Passed | Total-Failed | No. Boards Examined by | Percentage Failed | Original Number |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | .. | ..... | ..... | ..... | ..... | ..... | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 53 | 53 | 0 | 2 | 0.0 | 1 |
| 2 | .. | ..... | ..... | 10 | .. | 4 | 2 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 100 | .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 18 | 72 | 70 | 2 | 9 | 2.8 | 2 |
| 3 | .. | ..... | ..... | ..... | ..... | ..... | 1 | 10 | .. | ..... | ..... | 20 | ..... | .. | 10 | 20 | 01 | ..... | ..... | ..... | 20 | .. | ..... | ..... | ..... | 20 | 118 | 112 | 2 | 17 | 1.8 | 3 |
| 4 | .. | ..... | ..... | ..... | ..... | ..... | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 10 | 90 | 90 | 0 | 6 | 0.0 | 4 |
| 5 | .. | ..... | ..... | ..... | ..... | 10 | 1 | ..... | ..... | 10 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 10 | 79 | 79 | 0 | 5 | 0.0 | 5 |
| 7 | .. | ..... | ..... | ..... | ..... | ..... | 1 | ..... | ..... | ..... | ..... | 10 | ..... | ..... | ..... | ..... | ..... | 10 | .. | ..... | ..... | 10 | .. | ..... | ..... | 10 | 61 | 61 | 0 | 8 | 0.0 | 7 |
| 8 | .. | ..... | ..... | ..... | ..... | ..... | 0 | 1 | ..... | ..... | ..... | ..... | 20 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 10 | .. | 10 | 15 | 13 | 2 | 10 | 1.3 | 8 |
| 9 | .. | ..... | ..... | ..... | ..... | ..... | 0 | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1 | 1 | 0 | 1 | 0.0 | 9 |
| 10 | .. | ..... | ..... | 10 | .. | 10 | 1 | 1 | ..... | ..... | ..... | ..... | 1010 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 10 | 10 | 10 | ..... | ..... | 10 | 33 | 29 | 2 | 12 | 6.5 | 9 |
| 11 | .. | ..... | ..... | ..... | .. | 10 | 1 | 1 | ..... | ..... | ..... | ..... | 101 | ..... | 10 | ..... | ..... | ..... | ..... | ..... | 10 | .. | 10 | ..... | ..... | 10 | 33 | 28 | 2 | 11 | 6.5 | 11 |
| 12 | .. | ..... | ..... | ..... | ..... | ..... | 2 | 2 | ..... | ..... | ..... | ..... | 11 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 21 | 20 | 1 | 3 | 3.2 | 12 |
| 13 | .. | ..... | ..... | ..... | ..... | ..... | 1 | 1 | ..... | ..... | ..... | ..... | 101 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 03 | 02 | 1 | 3 | 1.2 | 13 |
| 14 | .. | ..... | ..... | 10 | .. | 10 | 3 | 5 | ..... | 10 | .. | 10 | 10 | ..... | ..... | 10 | .. | 10 | .. | ..... | ..... | 10 | .. | 10 | .. | 10 | 113 | 106 | 7 | 16 | 6.2 | 14 |
| 15 | 10 | .. | 10 | .. | 10 | .. | 1 | 1 | .. | 10 | 10 | 10 | .. | 20 | .. | ..... | 20 | .. | 10 | .. | ..... | 20 | 10 | 10 | .. | 10 | 232 | 210 | 4 | 31 | 1.6 | 15 |
| 16 | 10 | .. | ..... | ..... | ..... | ..... | 1 | 1 | .. | 10 | 10 | ..... | 10 | ..... | ..... | 10 | ..... | 10 | .. | ..... | ..... | 10 | 10 | 10 | .. | 10 | 93 | 90 | 1 | 20 | 1.0 | 16 |
| 17 | .. | 10 | ..... | ..... | ..... | ..... | 1 | 1 | .. | 10 | .. | ..... | 10 | ..... | ..... | 10 | ..... | 10 | .. | ..... | ..... | 00 | 10 | 10 | .. | 10 | 279 | 270 | 1 | 32 | 0.4 | 17 |
| 18 | .. | ..... | ..... | ..... | ..... | ..... | 0 | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 10 | .. | ..... | ..... | ..... | 122 | 113 | 9 | 9 | 7.4 | 18 |
| 19 | .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 10 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 45 | 43 | 2 | 9 | 4.4 | 19 |
| | .. | ..... | ..... | ..... | ..... | ..... | 3 | 0 | ..... | ..... | ..... | ..... | 20 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 20 | .. | 10 | .. | 20 | 89 | 89 | 0 | 11 | 0.0 | 20 |
| 21 | .. | ..... | ..... | ..... | ..... | ..... | 1 | 2 | 20 | .. | ..... | ..... | 10 | .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 20 | 20 | 10 | .. | 10 | 111 | 109 | 2 | 16 | 1.8 | 21 |
| 22 | .. | ..... | ..... | ..... | ..... | ..... | 0 | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 10 | .. | ..... | ..... | 10 | 03 | 02 | 1 | 5 | 0.0 | 22 |
| 23 | .. | ..... | ..... | ..... | ..... | ..... | 1 | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 10 | .. | ..... | ..... | 10 | .. | ..... | ..... | 10 | 150 | 137 | 1 | 13 | 0.6 | 23 |
| 24 | .. | ..... | 10 | ..... | ..... | ..... | 2 | 0 | 10 | .. | ..... | ..... | 10 | .. | ..... | 10 | ..... | ..... | ..... | ..... | 10 | ..... | ..... | 10 | .. | 10 | 03 | 03 | 0 | 11 | 0.0 | 24 |
| 25 | .. | .. | 10 | 10 | ..... | ..... | 2 | 0 | 10 | .. | ..... | ..... | 10 | .. | ..... | 10 | ..... | ..... | ..... | ..... | 10 | ..... | ..... | 10 | .. | 10 | 00 | 00 | 0 | 15 | 0.0 | 25 |
| 26 | .. | ..... | ..... | ..... | ..... | ..... | 1 | 1 | 00 | .. | ..... | ..... | 10 | .. | ..... | 10 | ..... | 10 | .. | ..... | 10 | 10 | .. | ..... | ..... | ..... | 8 | 8 | 0 | 4 | 0.0 | 26 |
| 27 | .. | ..... | 10 | ..... | ..... | ..... | 1 | 1 | 00 | .. | ..... | ..... | 10 | .. | 10 | 10 | ..... | 10 | .. | ..... | 10 | 10 | .. | ..... | ..... | 10 | 37 | 36 | 1 | 21 | 2.7 | 27 |
| 28 | 10 | ..... | ..... | ..... | ..... | ..... | 1 | 1 | .. | 10 | .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 10 | 10 | 20 | .. | 20 | 30 | 28 | 0 | 13 | 0.0 | 28 |
| 29 | .. | ..... | ..... | ..... | ..... | ..... | 1 | 1 | 10 | .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 10 | .. | ..... | ..... | ..... | 75 | 75 | 0 | 4 | 0.0 | 29 |
| 31 | 10 | ..... | ..... | ..... | ..... | ..... | 1 | 1 | 20 | .. | ..... | 10 | 10 | .. | 10 | ..... | ..... | 10 | .. | ..... | ..... | 10 | .. | ..... | ..... | 01 | 160 | 150 | 2 | 16 | 1.2 | 31 |
| 32 | .. | .. | 20 | .. | 10 | .. | 3 | 3 | 10 | .. | 10 | .. | 10 | .. | ..... | 10 | .. | ..... | ..... | ..... | 10 | 10 | 10 | .. | 20 | 10 | 161 | 157 | 4 | 19 | 2.5 | 32 |
| 33 | .. | .. | 10 | .. | ..... | ..... | 3 | 3 | 10 | .. | ..... | ..... | 10 | .. | ..... | 10 | .. | ..... | ..... | ..... | 10 | 10 | 10 | .. | 20 | 10 | 109 | 109 | 0 | 12 | 0.0 | 33 |
| 34 | .. | 10 | ..... | ..... | ..... | ..... | 1 | 2 | ..... | ..... | 10 | .. | 10 | .. | ..... | ..... | ..... | 10 | .. | ..... | ..... | 20 | .. | 10 | .. | 10 | 35 | 33 | 2 | 11 | 2.6 | 34 |
| 35 | .. | 10 | ..... | ..... | ..... | ..... | 1 | 2 | ..... | ..... | 10 | .. | 10 | .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 20 | .. | 10 | .. | 10 | 35 | 33 | 2 | 11 | 2.6 | 35 |
| 36 | .. | ..... | ..... | ..... | ..... | ..... | 0 | 0 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 5 | 5 | 0 | 3 | 0.0 | 36 |
| 37 | .. | .. | 10 | 10 | ..... | ..... | 2 | 2 | 10 | .. | ..... | ..... | 10 | 10 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 10 | 10 | ..... | ..... | 10 | 68 | 68 | 0 | 22 | 0.0 | 37 |
| 38 | .. | ..... | ..... | ..... | ..... | 01 | 1 | 1 | 10 | .. | ..... | ..... | 10 | 10 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 10 | 10 | ..... | ..... | 10 | 38 | 38 | 0 | 17 | 0.0 | 38 |
| 39 | .. | ..... | ..... | ..... | ..... | 01 | 1 | 1 | 10 | .. | ..... | ..... | 10 | 10 | ..... | 10 | ..... | ..... | ..... | ..... | ..... | 10 | 10 | ..... | ..... | 10 | 38 | 36 | 1 | 15 | 2.7 | 39 |
| 40 | 10 | ..... | ..... | ..... | ..... | 01 | 1 | 1 | 10 | .. | ..... | ..... | 10 | 10 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 10 | 10 | ..... | ..... | 10 | 38 | 34 | 1 | 14 | 2.9 | 40 |
| 41 | .. | ..... | ..... | ..... | ..... | 01 | 1 | 1 | 10 | .. | ..... | ..... | 10 | 10 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 10 | 10 | ..... | ..... | 10 | 38 | 34 | 1 | 14 | 2.9 | 41 |
| 42 | .. | ..... | ..... | ..... | ..... | 01 | 1 | 1 | 10 | .. | ..... | ..... | 10 | 10 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 10 | 10 | ..... | ..... | 10 | 38 | 34 | 1 | 14 | 2.9 | 42 |
| 43 | .. | ..... | ..... | ..... | ..... | 01 | 1 | 1 | 10 | .. | ..... | ..... | 10 | 10 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 10 | 10 | ..... | ..... | 10 | 38 | 34 | 1 | 14 | 2.9 | 43 |
| 44 | .. | ..... | ..... | ..... | ..... | 01 | 1 | 1 | 10 | .. | ..... | ..... | 10 | 10 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 10 | 10 | ..... | ..... | 10 | 38 | 34 | 1 | 14 | 2.9 | 44 |
| 45 | .. | ..... | ..... | ..... | ..... | ..... | 1 | 1 | 01 | .. | 10 | .. | 10 | .. | ..... | ..... | ..... | ..... | ..... | ..... | 10 | 10 | .. | ..... | ..... | ..... | 37 | 35 | 1 | 8 | 2.8 | 45 |
| 46 | .. | ..... | ..... | ..... | ..... | ..... | 1 | 1 | 01 | .. | 10 | .. | 10 | .. | ..... | ..... | ..... | ..... | ..... | ..... | 10 | 10 | .. | ..... | ..... | ..... | 37 | 35 | 1 | 8 | 2.8 | 46 |
| 47 | .. | ..... | ..... | ..... | ..... | ..... | 1 | 2 | 10 | .. | 10 | .. | 10 | .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 20 | .. | ..... | ..... | 10 | 90 | 87 | 3 | 7 | 3.3 | 47 |
| 48 | .. | ..... | ..... | ..... | ..... | ..... | 1 | 2 | 10 | .. | 10 | .. | 10 | .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 10 | .. | ..... | ..... | 10 | 104 | 101 | 3 | 8 | 2.9 | 48 |
| 50 | .. | ..... | ..... | ..... | ..... | ..... | 0 | 2 | ..... | .. | 00 | .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 10 | .. | 10 | .. | 02 | 79 | 76 | 3 | 10 | 3.7 | 50 |
| 51 | 10 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 10 | .. | ..... | 00 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 10 | .. | ..... | ..... | ..... | 115 | 110 | 1 | 13 | 0.9 | 51 |
| 52 | .. | ..... | ..... | 10 | 1 | .. | 5 | 12 | ..... | 10 | 0 | ..... | 45 | 20 | 0 | ..... | 10 | ..... | ..... | ..... | ..... | 10 | 20 | ..... | ..... | 10 | 137 | 122 | 15 | 21 | 10.9 | 52 |
| 53 | .. | .. | 10 | .. | 10 | .. | 1 | 1 | 10 | 10 | 10 | .. | 10 | 10 | 0 | 10 | 10 | .. | .. | .. | .. | 10 | 20 | 10 | .. | 10 | 171 | 169 | 2 | 21 | 1.2 | 53 |
| | 35 | 36 | 37 | 38 | 39 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | | | | | | |

137
48

Table 2.—CANDIDATES EXAMINED BY

| Original Number | SCHOOL | 1 Alabama P | F | 2 Arizona P | F | 3 Arkansas P | F | 4 California P | F | 5 Colorado P | F | 6 Connecticut P | F | 7 Delaware P | F | 8 Dist. of Columbia P | F | 9 Florida P | F | 10 Georgia P | F | 11 Idaho P | F | 12 Illinois P | F | 13 Indiana P | F | 14 Iowa P | F | 15 Kansas P | F | 16 Kentucky P | F | 17 Louisiana P | F | 18 Maine P | F | 19 Maryland P | F | 20 Massachusetts P | F | 21 Michigan P | F | 22 Minnesota P | F | 23 Mississippi P | F | 24 Missouri P | F | Original Number |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PENNSYLVANIA (continued) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 55 | Univ. of Pennsylvania | 6 | 0 | | | | | 10 | 10 | | | 1 | 0 | 10 | 11 | 1 | | | | | | | | 2 | 0 | | | | | | | | | | | 20 | | | | | | 6 | 0 | 2 | 0 | | | | | 55 |
| 56 | Univ. of Pittsburgh | | | | | | | | | | | | | | | | | | | | | | | 1 | 0 | | | | | | | | | | | | | | | | | 10 | | | | | | | | 56 |
| 57 | Woman's Med. Col. | | | | | | | 10 | | | | | | | | | | | | | | | | 1 | 0 | | | | | | | | | | | | | 1 | 0 | 20 | | | | | | | | 57 |
| | SOUTH CAROLINA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 58 | Med. Col. of the State of South Carolina | | | | | | | | | | | | | | | | | | | 30 | | 10 | | 2 | 0 | | | | | | | | | | | | | | | | | | | | | | | 58 |
| | TENNESSEE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 59 | Doherty Med. Col. | | | | | 10 | | | | | | 10 | | | | 10 | 30 | | | | | 10 | | 2 | 0 | 11 | | | | 20 | | | | | | | | 0 | 1 | | | | | 5 | 0 | 59 |
| 60 | Univ. of Tennessee | 6 | 0 | | | 11 | | | | 10 | | 10 | | | | 10 | 15 | | | | | 10 | | 2 | 0 | | | | | | | | | 0 | 1 | | | | | | | 20 | 20 | 6 | 0 | 60 |
| 61 | Vanderbilt Univ. | | | | | | | | | | | | | | | | 10 | 0 | | | | | | | | | | | | | | | | 10 | | | | | | | | | | | | 61 |
| | TEXAS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 62 | Baylor Univ. | | | | | 10 | | | | | | | | | | 01 | | | | | | | | 1 | 0 | | | | | | | | | | | | | | | | | 20 | | | | | | 62 |
| 63 | Southwestern Med. Col. of the Southwestern Med. Foundation | 10 | | | | 10 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 10 | | | | | | 63 |
| 64 | Univ. of Texas | 10 | 0 | 20 | | 10 | | | | | | | | | | | | | | | | 10 | | | | | | | | | | | | 10 | | | | | | | | 20 | | | | | | 64 |
| | UTAH | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 65 | Univ. of Utah | | | | | 10 | | | | | | | | | | 10 | | | | 10 | | | | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | 65 |
| | VERMONT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 66 | Univ. of Vermont | | | | | 10 | | | 10 | | | | | | | 10 | | | | | | | | | | | | 10 | | | | | | | 10 | | | | | | | | | | | | 66 |
| | VIRGINIA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 67 | Med. Col. of Virginia | | | | | | | | | | | 1 | 0 | | | 40 | | 10 | | | | | | | | | | | | | | 10 | | 10 | | 30 | | | | | | 10 | | | | | | 67 |
| 68 | Univ. of Virginia | 6 | 0 | | | | | | | | | | | | | 40 | | 10 | 10 | | | | | | | | | | | | | | | | | | | | | | | 10 | 20 | | | | | 68 |
| | WISCONSIN | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 69 | Marquette Univ. | | 1 | 4 | | | | 100 | 20 | | | | | | | | | | | | | | | 4 | 0 | 20 | 10 | | | | | | | 10 | | | | 1 | 0 | 50 | | 60 | 10 | | | | | 69 |
| 70 | Univ. of Wisconsin | | 10 | | | | | 70 | 10 | 10 | | | | | | | | 30 | | | | 10 | | 4 | 0 | 10 | | | | | | | | 10 | | 20 | | | | | | 20 | | | | | | 70 |
| | CANADA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 71 | Dalhousie Univ. | | | | | | | | | | | | | | | | | | | | | | | 2 | 0 | | | | | | | | | | | 20 | | | | | | | | | | | | 71 |
| 72 | Laval Univ. | | | | | | | | | 10 | | | | | | | | | | | | | | 2 | 0 | | | | | | | | | | | 10 | | 3 | 5 | | | | | | | | | 72 |
| 73 | McGill Univ. | 20 | | | | 70 | | 20 | | | | | | | | | | 10 | 10 | | | | | 3 | 0 | 20 | | | | | | | | | | 30 | | 1 | 1 | | | 10 | | | | | | 73 |
| 74 | Queen's Univ. | | | | | | | | | | | | | | | | | | | | | | | 1 | 0 | | | | | | | | | | | 10 | | | | | | 10 | | | | | | 74 |
| 75 | Univ. of Alberta | | | | | 20 | | | | | | | | | | | | | | | | | | 1 | 0 | | | | | | | | | | | 10 | | | | | | | | | | | | 75 |
| 76 | Univ. of Manitoba | | | | | 60 | | | | | | | | | | | | | | | | | | 2 | 0 | | | | | | | | | | | | | | | | | 20 | | 10 | | | | 76 |
| 77 | Univ. of Montreal | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 01 | | | | | | | | | | | | 77 |
| 78 | Univ. of Toronto | | | | | 110 | | | | 10 | | | | | | | | 30 | | | | | | 2 | 0 | 20 | | | | | | | | | | 10 | | 2 | 1 | 2 | | 10 | | 20 | | | | 78 |
| 79 | Univ. of Western Ontario | | | | | | | | | | | | | | | | | | | | | | | 1 | 0 | 10 | | | | | | | | | | 10 | | | | | | 20 | | | | | | 79 |
| | OTHERS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 80 | Foreign Med. Faculties | | | | | 230 | 70 | 911 | | | | 60 | 50 | 10 | | | | | | | | | | 26 | 14 | 20 | 10 | 10 | 10 | | | | | | | 30 | 12 | 60 | 12 | | | 20 | 70 | 80 | | | | 80 |
| 81 | Extant Med. Schools | 10 | | | | | | 10 | | | | | 50 | 10 | 10 | | | | | | | | | 14 | 6 | | | | | 20 | | | | | | 8 | 2 | | | | | | | | | | | 81 |
| 82 | Unapproved Med. Schools | | | | | | | | | | | | | 10 | | | | | | | | | | | | | | | | | | | | | | 3711 | | | | | | | | | | | | 82 |
| 83 | Schools of Osteopathy | 1 | | | | | | 11 | 03 | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | 2 | 7 | | | | | | | | | | | 83 |
| 84 | Totals | 97 | 22 | 34 | 513 | 95 | 44 | 18 | 39 | 331 | 129 | 62 | | 621 | 123 | 55 | 86 | 90 | | 226 | 33 | 181 | | 224 | 116 | 248 | | 38 | 267 | 84 |
| 85 | Totals—Examined—Passed | 97 | 19 | 34 | 503 | 95 | 44 | 18 | 39 | 314 | 129 | 62 | | 605 | 111 | 55 | 86 | 90 | | 225 | 31 | 175 | | 84 | 116 | 248 | | 38 | 265 | 85 |
| 86 | Totals—Examined—Failed | 0 | 3 | 0 | 10 | 0 | 0 | 17 | 0 | 17 | 0 | 0 | | 16 | 12 | 0 | 0 | 0 | | 1 | 2 | 6 | | 140 | 0 | 0 | | 0 | 2 | 86 |
| 87 | Percentage Failed | 0.0 | 13.6 | 0.0 | 1.9 | 0.0 | 25.0 | 0.0 | 0.0 | 5.1 | 0.0 | 0.0 | | 2.6 | 9.8 | 0.0 | 0.0 | 0.0 | | 0.4 | 6.1 | 3.3 | | 62.5 | 0.0 | 0.0 | | 0.0 | 0.8 | 87 |
| | | 1 | | 2 | | 3 | | 4 | | 5 | | 6 | | 7 | | 8 | | 9 | | 10 | | 11 | | 12 | | 13 | | 14 | | 15 | | 16 | | 17 | | 18 | | 19 | | 20 | | 21 | | 22 | | 23 | | 24 | |

P—Passed; F—Failed.

## STATE BOARDS OF MEDICAL EXAMINERS

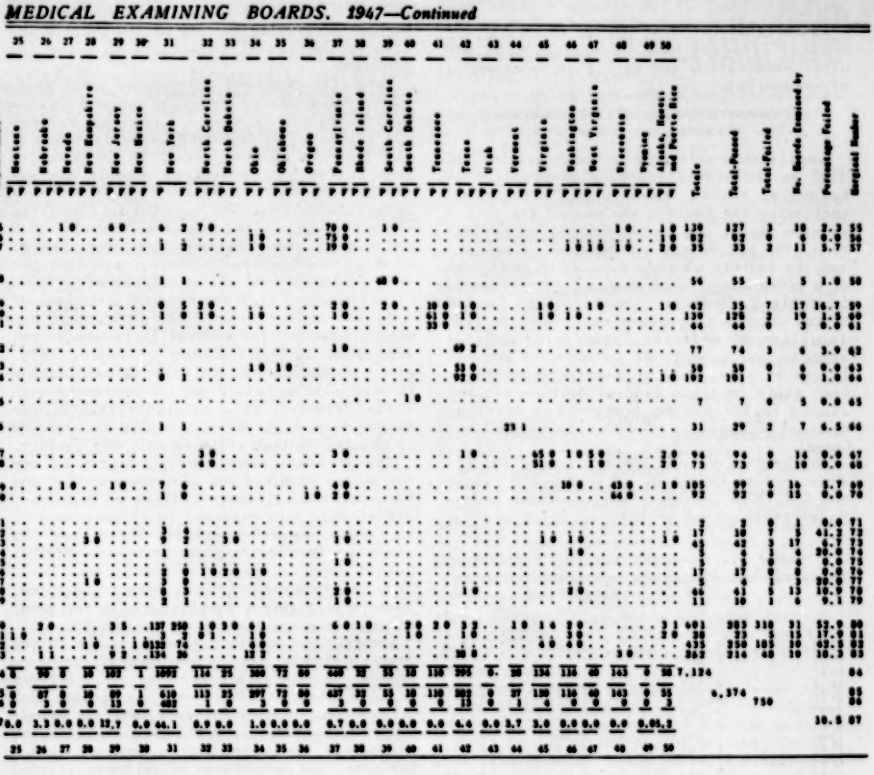
### LICENSES ISSUED

During the year 1947 there were 14,429 licenses to practice medicine issued by the medical examining boards of the forty-eight states, the District of Columbia, Alaska, Hawaii, Puerto Rico and the Virgin Islands, as shown in table 1. Of these licenses 6,747 were issued after examination and 7,682 by reciprocity and endorsement of other state licenses or of the certificate of the National Board of Medical Examiners.

It does not follow that all physicians certified in a given year after examination were tested in that year. In twenty-four states, the District of Columbia, Alaska, Canal Zone, Hawaii, Puerto Rico and the Virgin Islands, the internship is a requisite for practice, but in several of these states the physician candidate is permitted to take the written examination before completion of the internship and, if successful, the license is withheld and dated on completion of the internship. Licenses are also withheld in some states for proof of citizenship and other technicalities. In other states the licenses of those examined in December are dated and issued in the following year. The statistics in table 1, therefore, include many who were examined in 1946 and even a few in previous years. Consequently, figures in this table will not correspond with those hereinafter given, which deal entirely with physicians examined for licensure within the year 1947.

Likewise, the figures presented in this table, particularly in the endorsement group, do not necessarily represent individuals, since the figures include persons who may have been licensed in more than one state during a given year. Neither does the total figure represent additions to the medical profession. In Tables 12, 13 and 14 (see pages 620 and 621) can be noted the number who secured licenses

## MEDICAL EXAMINING BOARDS, 1947—Continued



for the first time and represent additions to the medical profession in the United States and its territories and possessions.

Of the 14,429 licenses to practice medicine and surgery issued in 1947, the greatest number (1,860) were issued in California. New York issued 1,645 and Illinois 904, while Ohio, Pennsylvania and Texas licensed more than 600 physicians. Sixteen states and the territories and possessions licensed fewer than 100. The fewest, 19, were licensed in Nevada.

While in 1947 the number licensed was greater than in any prewar year, there were 1,002 fewer licensed than in 1946.

The decrease in licenses issued was evident only in the group licensed without examination. Those registered after examination was 185 more than in 1946. Increases in licenses issued, however, as compared with 1946 were recorded in thirteen states and the territories and possessions as follows:

| | 1946 | 1947 |
|---|---|---|
| Arizona | 100 | 103 |
| Florida | 318 | 326 |
| Idaho | 56 | 71 |
| Indiana | 250 | 264 |
| Kentucky | 182 | 237 |
| Louisiana | 283 | 325 |
| Maryland | 343 | 354 |
| Minnesota | 380 | 420 |
| New Mexico | 59 | 66 |
| North Carolina | 286 | 336 |
| North Dakota | 30 | 53 |
| South Dakota | 46 | 53 |
| Washington | 294 | 301 |
| Territories and Possessions | 101 | 104 |

Totals for twelve previous years and for 1947 by all methods of licensure are included in table 3. The high figures for the years 1936 to 1941 in the annual number of licenses issued were due to the licensure of foreign graduates. In succeeding years the accelerated programs in medical schools which produced 20,662 graduates in a three year cycle increased the numbers annually licensed. The noticeable increase in the last two years

reflects the migration of veteran medical officers.

In the thirteen year period shown 130,052 medical licenses have been issued, 82,049 after examination and 48,003 by endorsement of credentials.

### CANDIDATES EXAMINED BY MEDICAL EXAMINING BOARDS

Compilations referring to those examined in 1947 by individual states, the District of Columbia, Alaska, Hawaii and Puerto Rico, indicating the numbers who passed and failed in each state, the medical school of graduation, the percentage of failures by schools and the numbers of states in which graduates of a given school were examined, are recorded in table 2. Medical schools in the United States which are no longer operating, foreign faculties of medicine, unapproved medical schools and schools of osteopathy are not listed by name, but the numbers examined in each state in these four categories are included following the figures for existing medical schools in the United States and Canada.

In the past year 7,124 applicants for licensure were examined, of whom 6,374 passed and 588, 10.5 per cent, failed. These candidates represented seventy approved medical schools in the United States, nine approved medical schools of Canada, fifteen United States medical schools now extinct, 102 faculties of medicine of other countries, six unapproved medical schools in the United States and eight schools of osteopathy. Osteopaths who were granted the privilege to practice medicine, surgery or both by medical examining boards are included in these statistics. Osteopaths who obtain the legal right to special practice by the osteopathic board are not included in these compilations.

TABLE 3.—*Licenses Issued, 1935-1947*

| | Examination | Reciprocity and Endorsement | Total |
|---|---|---|---|
| 1935 | 5,725 | 2,194 | 7,919 |
| 1936 | 6,275 | 2,773 | 9,048 |
| 1937 | 6,629 | 3,205 | 9,834 |
| 1938 | 6,557 | 2,956 | 9,513 |
| 1939 | 6,400 | 2,872 | 9,272 |
| 1940 | 6,289 | 2,866 | 9,155 |
| 1941 | 6,056 | 2,760 | 8,816 |
| 1942 | 6,142 | 2,469 | 8,611 |
| 1943 | 6,060 | 2,340 | 8,400 |
| 1944 | 7,062 | 2,596 | 9,658 |
| 1945 | 5,545 | 3,621 | 9,166 |
| 1946 | 6,562 | 9,669 | 16,231 |
| 1947 | 6,747 | 7,682 | 14,429 |
| Totals | 82,049 | 48,003 | 130,052 |

In recent years examinations and reciprocity meetings have been scheduled at frequent times by many states to facilitate licensure and enable physicians to commence the practice of medicine without delay. Later in this study there is included a tabulation giving the schedules for all states. This effort on the part of officers of licensing boards is noteworthy, especially in view of the greatly increased numbers of physicians applying for licensure.

The 7,124 examinees represented 5,645 graduates of approved medical schools in the United States, of whom 3.1 per cent failed; 153 graduates of approved Canadian schools, 11.8 per cent of whom failed; 28 who graduated from United States medical schools now extinct, with 17.9 % failures; 691 graduates of faculties of medicine located in countries other than the United States and Canada, 52.9 per cent of whom failed; 435 graduates of of unapproved medical schools, with 42.5 per cent failures, and 262 graduates of schools of osteopathy, 18.3 per cent of whom failed.

As in table 1, the 7,124 physicians and others examined for medical licensure do not represent an equal number of individuals, since a candidate might take an examination in more than one state and is counted in each state. However, if a candidate failed more than once in a given state within the year he is counted in that state as only one failure.

The greatest number of graduates of any one school examined was 279, representing the University of Illinois College of Medicine, 218 of whom were examined in Illinois and 61 in twenty-one other states. There were 252 graduates from Northwestern University Medical School examined in thirty-one states. Fewer than 200 from other schools were represented. There were eighteen institutions in the group of schools whose graduates exceeded 100.

Twenty-three approved schools in the United States had no failures before medical licensing boards, 32 less than 5 per cent and 9 between 5 and 10 per cent. There were six schools with 10 per cent or more failures in state examinations. Failures from all existing approved schools in the United States amounted to 3.1 per cent. The percentages of failures recorded by school in table 6 which includes those who were examined by the National Board of Medical Examiners in its final examination as well as those passing state tests probably presents a more accurate analysis of the quality of the graduates of these schools on the basis of their proficiency in examination tests.

Graduates of the Medical College of Alabama, which had developed an approved four year program and graduated its first class in 1946, appeared for the first time for licensure in 1947. All the 53 graduates examined were passed. They were registered in Alabama and Florida.

Three of the five homeopathic boards in existence examined 9 candidates; Connecticut 3, Delaware 4, and Maryland 1. The homeopathic and eclectic boards in Arkansas and the homeopathic board in Louisiana did not examine any one in 1947.

Graduates of Northwestern University Medical School were examined in the greatest number of states—thirty one. Six schools had graduates

examined in more than twenty states. Seven schools had graduates examined in fewer than five states.

One hundred and fifty-three graduates of the nine approved medical schools in Canada were tested for medical licensure in the United States in 1947 in twenty-two states and Alaska (table 4); 135 passed and 18, 11.8 per cent, failed. The majority appeared before the boards in California, Illinois, Maine and New York.

TABLE 4.--*Graduates of Medical Schools in Canada Examined for Licensure in the United States, 1947*

| | Examined | Passed | Failed |
|---|---|---|---|
| Alabama | 2 | 2 | 0 |
| California | 28 | 28 | 0 |
| Connecticut | 4 | 4 | 0 |
| Florida | 4 | 4 | 0 |
| Georgia | 1 | 1 | 0 |
| Illinois | 11 | 11 | 0 |
| Indiana | 7 | 7 | 0 |
| Louisiana | 2 | 2 | 0 |
| Maine | 11 | 10 | 1 |
| Maryland | 2 | 2 | 0 |
| Massachusetts | 9 | 3 | 6 |
| Minnesota | 9 | 9 | 0 |
| Missouri | 1 | 1 | 0 |
| New Hampshire | 4 | 4 | 0 |
| New York | 39 | 28 | 11 |
| North Carolina | 1 | 1 | 0 |
| North Dakota | 5 | 5 | 0 |
| Ohio | 1 | 1 | 0 |
| Pennsylvania | 5 | 5 | 0 |
| Texas | 1 | 1 | 0 |
| Virginia | 1 | 1 | 0 |
| Washington | 4 | 4 | 0 |
| Alaska | 1 | 1 | 0 |
| Totals | 153 | 135 | 18 |

The highest percentage of failures was 41.2 per cent, representing 17 graduates of Laval University Faculty of Medicine who were examined in five states. Three Canadian schools had no failures before United States licensing boards, while the other schools had more than 5 per cent failures.

Graduates of medical schools of other countries were examined by thirty-one boards. There were 601 such graduates with 318 (52.9 per cent) failures.

Twenty-eight graduates of medical schools no longer operating were tested by fifteen boards, of whom 23 passed and 5 (17.9 per cent) failed.

There were 435 graduates of unapproved medical schools examined in ten states, of whom 185, 42.5 per cent, failed. Two-hundred and sixty-two osteopaths were tested in ten states, with 19.3 per cent failures. Those registered in these two categories are discussed separately later in an analysis of these statistics.

Altogether, there were 7,124 candidates who appeared for licensure in 1947, of whom 6,374 passed and 750, 10.5 per cent, failed.

The source of applicants for licensure last year on the basis of examination is further tabulated in table 5, giving totals for six groups, namely, approved medical schools in the United States and those in Canada, schools no longer in existence, foreign faculties of medicine, unapproved medical schools and schools of osteopathy. As previously mentioned, 3.1 per cent of graduates from the schools of the United States, 11.8 per cent from Canadian schools and 17.9 per cent from extinct medical schools failed. The greatest percentage of failures represented three groups--foreign and unapproved medical schools and schools of osteopathy.

Figures which indicate actual licentiates and represent additions to the medical profession in 1947 are given later in tables 12, 13 and 14.

### CONSOLIDATED EXAMINATIONS

A more accurate picture of the performance of graduates in licensure examinations than the foregoing is given by the figures which combine the results of state medical board examinations with those of part III of the National Board examinationg (table 6). It can be noted that in some instances schools having a high percentage of failures before state licensing boards had few, if any, failures before the National Board. In 1947 there were 5,642 graduates of approved medical schools in the United States examined by medical licensing boards, of whom 3.1 per cent failed. In the same period 1,708 graduates of these institutions appeared for part III of the examinations of the National Board of Medical Examiners, of whom 0.9 per cent failed. In these consolidated figures for 7,350 graduates, the percentage of failures of approved medical schools in the United States was reduced to 2.3 per cent.

In calculating the percentage of failures no person was counted as a failure more than once. Eleven individuals had more than one failure during 1947. Of these, three were from United States approved schools and 8 from foreign schools.

Of the Canadian graduates, 11.8 per cent failed state board tests and 10.9 the combined tests. Only 11 graduates of foreign medical schools were admitted to the National Board's final examination, while 601 were examined by state licensing boards. Two graduates of extinct approved medical schools appeared before the National Board and 28 before state boards.

TABLE 5.--*Source of Candidates Examined for Licensure in the United States, 1947*

| Medical Schools | Number Schools | Number Examined | Number Passed | Number Failed | Percentage Passed |
|---|---|---|---|---|---|
| Approved in U.S. | 79 | 5,445 | 5,459 | 174 | 3.1 |
| Approved in Canada | 9 | 153 | 135 | 18 | 11.8 |
| Extinct | 15 | 28 | 23 | 5 | 17.9 |
| Foreign | 192 | 491 | 243 | 318 | 52.9 |
| Unapproved schools | 4 | 435 | 250 | 185 | 42.5 |
| Schools of Osteopathy | 9 | 262 | 214 | 48 | 18.3 |
| Totals | 219 | 7,124 | 6,374 | 750 | 10.5 |

No comparison can be made of these groups. The National Board does not admit to its examinations the graduates of unapproved medical schools or schools of osteopathy, and from foreign schools it admits only the graduates of the university medical schools of Great Britain and Ireland.

TABLE 6.--*Consolidated Examinations, State Medical Examining Boards and the National Board of Medical Examiners, 1947*

| School | Results by Medical Examining Board Tests | | Part III Examination of National Board of Medical Examiners | | Total Examined | Totals | | % F |
|---|---|---|---|---|---|---|---|---|
| | P | F* | P | F* | | P | F | |
| Medical College of Alabama | 53 | 0 | 0 | 0 | 53 | 0 | 0 | 0.0 |
| University of Arkansas | 70 | 2 | 1 | 0 | 73 | 71 | 2 | 2.7 |
| Coll. of Med. Evan. (Calif.) | 112 | 2 | 43 | 2 | 159 | 155 | 4 | 2.5 |
| Stanford University | 69 | 0 | 2 | 0 | 71 | 71 | 0 | 0.0 |
| University of California | 68 | 0 | 2 | 0 | 70 | 70 | 0 | 0.0 |
| Univ. of Southern California | 79 | 0 | 1 | 0 | 80 | 80 | 0 | 0.0 |
| University of Colorado | 61 | 0 | 10 | 0 | 71 | 71 | 0 | 0.0 |
| Yale University (Connecticut) | 13 | 2 | 67 | 1 | 83 | 80 | 3 | 3.6 |
| George Washington Univ. (D. C.) | 29 | 2 | 64 | 2 | 97 | 93 | 4 | 4.1 |
| Georgetown University | 58 | 4 | 47 | 0 | 109 | 105 | 4 | 3.7 |
| Howard University | 75 | 7 | 14 | 0 | 96 | 89 | 7 | 7.3 |
| Emory University (Georgia) | 88 | 3 | 1 | 0 | 92 | 89 | 3 | 3.3 |
| University of Georgia | 84 | 1 | 0 | 0 | 85 | 84 | 1 | 1.2 |
| Loyola University (Illinois) | 106 | 7 | 9 | 0 | 122 | 115 | 7 | 5.7 |
| Northwestern University | 248 | 4 | 15 | 0 | 267 | 263 | 4 | 1.5 |
| University of Chicago | 84 | 1 | 1 | 0 | 86 | 85 | 1 | 1.2 |
| University of Illinois | 278 | 1 | 5 | 0 | 284 | 283 | 1 | 0.3 |
| Indiana University | 113 | 9 | 13 | 0 | 135 | 126 | 9 | 6.7 |
| State University of Iowa | 43 | 2 | 28 | 0 | 73 | 71 | 2 | 2.7 |
| University of Kansas | 89 | 0 | 0 | 0 | 89 | 89 | 0 | 0.0 |
| University of Louisville (Ky.) | 109 | 2 | 7 | 0 | 118 | 116 | 2 | 1.7 |
| Louisiana State University | 83 | 0 | 3 | 0 | 86 | 86 | 0 | 0.0 |
| Tulane University | 157 | 1 | 7 | 1 | 166 | 164 | 2 | 1.2 |
| Johns Hopkins Univ. (Maryland) | 69 | 0 | 16 | 0 | 85 | 85 | 0 | 0.0 |
| University of Maryland | 109 | 0 | 7 | 0 | 116 | 116 | 0 | 0.0 |
| Boston Univ. (Massachusetts) | 8 | 0 | 65 | 0 | 73 | 73 | 0 | 0.0 |
| Harvard Medical School | 57 | 2 | 143 | 0 | 202 | 200 | 2 | 1.0 |
| Tufts College Med. School | 26 | 1 | 117 | 0 | 144 | 143 | 1 | 0.7 |
| University of Michigan | 30 | 0 | 9 | 2 | 41 | 39 | 2 | 4.9 |
| Wayne University | 75 | 0 | 5 | 0 | 80 | 80 | 0 | 0.0 |
| University of Minnesota | 158 | 2 | 7 | 0 | 167 | 165 | 2 | 1.2 |
| St. Louis University (Missouri) | 157 | 4 | 16 | 2 | 179 | 173 | 6 | 3.4 |
| Washington University | 109 | 0 | 8 | 0 | 117 | 117 | 0 | 0.0 |
| Creighton University (Nebraska) | 54 | 2 | 14 | 0 | 70 | 68 | 2 | 2.9 |
| University of Nebraska | 83 | 2 | 9 | 0 | 94 | 92 | 2 | 2.1 |
| Albany Medical College (N. Y.) | 5 | 0 | 48 | 0 | 53 | 53 | 0 | 0.0 |
| Columbia University | 46 | 4 | 123 | 0 | 173 | 169 | 4 | 2.3 |
| Cornell University | 35 | 1 | 57 | 0 | 93 | 92 | 1 | 1.1 |
| Long Island College of Medicine | 38 | 14 | 93 | 1 | 146 | 131 | 15 | 10.3 |
| New York Medical College | 14 | 5 | 93 | 2 | 114 | 107 | 7 | 6.1 |
| New York University | 52 | 8 | 106 | 0 | 166 | 158 | 8 | 4.8 |
| Syracuse University | 23 | 7 | 27 | 0 | 57 | 50 | 7 | 12.3 |
| University of Buffalo | 3 | 0 | 82 | 0 | 85 | 85 | 0 | 0.0 |
| University of Rochester | 25 | 6 | 43 | 0 | 74 | 68 | 6 | 8.1 |
| Duke University | 25 | 1 | 66 | 0 | 92 | 91 | 1 | 1.1 |
| Bowman-Gray Sch. of Med. (N. C.) | 47 | 0 | 1 | 0 | 48 | 48 | 0 | 0.0 |
| Ohio State University | 87 | 3 | 0 | 0 | 90 | 87 | 3 | 3.3 |
| University of Cincinnati | 101 | 3 | 3 | 0 | 107 | 104 | 3 | 2.8 |
| Western Reserve University | 91 | 3 | 4 | 0 | 98 | 95 | 3 | 3.1 |
| University of Oklahoma | 79 | 3 | 1 | 0 | 83 | 80 | 3 | 3.6 |
| University of Oregon | 114 | 1 | 4 | 0 | 119 | 118 | 1 | 0.8 |
| Hahnemann, Philadelphia (Pa.) | 122 | 15 | 26 | 1 | 164 | 148 | 16 | 9.8 |
| Jefferson Medical College | 169 | 2 | 15 | 0 | 186 | 184 | 2 | 1.1 |
| Temple University | 158 | 8 | 8 | 0 | 174 | 166 | 8 | 4.6 |
| University of Pennsylvania | 127 | 3 | 39 | 0 | 169 | 166 | 3 | 1.8 |
| University of Pittsburgh | 82 | 0 | 2 | 0 | 84 | 84 | 0 | 0.0 |
| Meharry Medical College | 33 | 1 | 15 | 0 | 49 | 48 | 1 | 2.0 |
| Med. Coll. of South Carolina | 55 | 2 | 0 | 0 | 57 | 55 | 2 | 3.5 |
| Meharry Medical College (Tenn.) | 35 | 6 | 23 | 2 | 66 | 58 | 8 | 12.1 |
| University of Tennessee | 128 | 2 | 1 | 0 | 131 | 129 | 2 | 1.5 |
| Vanderbilt University | 44 | 0 | 2 | 0 | 46 | 44 | 0 | 0.0 |
| Baylor University (Texas) | 74 | 3 | 1 | 0 | 78 | 75 | 3 | 3.8 |
| Southwestern Medical College | 58 | 0 | 0 | 0 | 58 | 58 | 0 | 0.0 |
| University of Texas | 101 | 1 | 0 | 0 | 102 | 101 | 1 | 1.0 |
| University of Utah | 7 | 0 | 0 | 0 | 7 | 7 | 0 | 0.0 |
| University of Vermont | 29 | 2 | 22 | 1 | 54 | 51 | 3 | 5.6 |
| Medical College of Virginia | 94 | 0 | 2 | 0 | 96 | 96 | 0 | 0.0 |
| University of Virginia | 73 | 0 | 11 | 0 | 84 | 84 | 0 | 0.0 |
| Marquette University (Wisconsin) | 99 | 6 | 16 | 0 | 121 | 115 | 6 | 5.0 |
| University of Wisconsin | 92 | 0 | 1 | 0 | 93 | 93 | 0 | 0.0 |
| Subtotals: U. S. Schools | 5,469 | 173 | 1,691 | 17 | 7,350 | 7,160 | 190 | 2.3 |
| Dalhousie Univ. (Nova Scotia) | 2 | 0 | 0 | 0 | 2 | 2 | 0 | 0.0 |
| Laval University (Quebec) | 10 | 7 | 1 | 1 | 19 | 11 | 8 | 42.1 |
| McGill University | 42 | 3 | 16 | 0 | 61 | 58 | 3 | 4.9 |
| Queen's University (Ontario) | 4 | 1 | 0 | 0 | 5 | 4 | 1 | 20.0 |
| University of Alberta | 5 | 0 | 0 | 0 | 5 | 5 | 0 | 0.0 |
| University of Manitoba | 17 | 0 | 1 | 0 | 18 | 18 | 0 | 0.0 |
| University of Montreal (Quebec) | 4 | 1 | 0 | 0 | 5 | 4 | 1 | 0.0 |
| University of Toronto (Ontario) | 41 | 5 | 1 | 0 | 47 | 42 | 5 | 10.6 |
| University of Western Ontario | 10 | 1 | 2 | 0 | 13 | 12 | 1 | 7.7 |

TABLE 6.--*Consolidated Examinations, 1947--Continued*

| | Results by Medical Examining Board Tests | | Part III Examination of National Board of Medical Examiners | | Total Examined | Totals | | SF |
|---|---|---|---|---|---|---|---|---|
| | P | F* | P | F* | | P | F | |
| Subtotals: Canadian Schools | 135 | 18 | 21 | 1 | 175 | 156 | 19 | 10.9 |
| Foreign Medical Faculties | 283 | 310 | 11 | 0 | 604 | 294 | 310 | 51.3 |
| Extinct Medical Schools | 23 | 5 | 2 | 0 | 30 | 25 | 5 | 16.7 |
| Unapproved Schools | 250 | 185 | 0 | 0 | 435 | 250 | 185 | 42.5 |
| Schools of Osteopathy | 214 | 48 | 0 | 0 | 263 | 214 | 48 | 18.6 |
| Totals | 6,374 | 739 | 1,725 | 18 | 8,856 | 8,099 | 757 | 8.5 |

*Represents individuals failed.

The total of all examined before medical licensing boards as shown in this table was 7,113, of whom 6,374 passed and 739, 10.5 per cent failed. For both groups--state boards and the National Board--8,856 were examined; 8,099 passed and 757, or 8.5 per cent, failed. The total percentage of failures was not greatly reduced because of the high percentage of failures before state boards of foreign, unapproved and osteopathic graduates. Sixty-two schools in the United States and five in Canada were represented in both state and National Board examinations.

Of the Canadian graduates, 11.8 per cent failed state board tests and 10.9 per cent the combined tests. Only 11 graduates of foreign medical schools were admitted to the National Board's final examination, while 601 were examined by state licensing boards. Two graduates of extinct approved medical schools appeared before the National Board and 28 before state boards. No comparison can be made of these groups. The National Board does not admit to its examinations the graduates of unapproved medical schools or schools of osteopathy, and from foreign schools it admits only the graduates of the university medical schools of Great Britain and Ireland.

### FAILURES

Failures before medical licensing boards by licentiates of 1947 are recorded in table 7. In presenting these statistics the United States is divided into two groups--the thirty-one states and the District of Columbia in which approved four year medical schools are located and the states, territories and possessions which have no four year medical school within their boundaries. The figures include the number of licentiates who failed state board examinations and were graduates of a medical school located in the state in which they were examined and, for comparison, the number of graduates licensed in a given state who obtained their professional training in schools in other states.

In general, state licensing boards require the applicant to receive a general average of 75 per cent and 60 per cent in any one subject. In case of failure in not more than two subjects, the applicant is permitted to retake an examination in those subjects within twelve months. A few states consider such persons as conditioned in the subjects in which they fail and do not report them to the office of the Council on Medical Education and Hospitals as failures. In such instances they are not considered in the calculations in this study. When their grades are raised after a successful test in the subjects in which they failed they are recorded among those who passed.

From the first group, 56 physicians failed examinations in the state in which they obtained their professional training. This occurred in nine states. New York reported 39 failures from New York schools. Twenty-three states had no failures from approved schools within their boundaries. On the other hand, seven states reported 94 failures among students who graduated from approved medical schools located in states other than the one in which they were examined. Likewise, in this group New York reported the greatest number, 80. Twenty-one states had no failures in either group, six states had failures in both groups, three states had failures from schools within their state and none from other schools while two had failures from schools in other states only.

In seventeen states having no medical schools, three reported 26 failures--Arizona, Florida and New Jersey. Fifteen of these failures occurred in Florida.

The total examined in the first group—states in which approved four year medical schools are located—was 6,181, while in the second group—states which have no approved four year medical school within their boundaries--943 were examined.

The data pertaining to licensure failures are further subdivided in table 8 by the number of candidates who were licensed after previously failing a licensing examination. The figures are presented for three categories--approved medical schools in the United States and Canada, foreign faculties of medicine and unapproved medical schools and schools of osteopathy. These groups are classified according to the number licensed after failing a state board examination

TABLE 7.--*Licensure Failures by Graduates of Approved Schools Located in the State Where Examined and Elsewhere, 1947*

| States with Medical Schools | Total No. Examined | No. Failures from Schools in State | No. Schools in State Represented at Examinations | Per Cent Failed | No. Failures from Schools out of State | No. Schools out of State Represented at Examinations | Per Cent Failed | Per Cent Failed from all U.S. Schools |
|---|---|---|---|---|---|---|---|---|
| Alabama | 97 | 0 | 1 | 0.0 | 2 | 14 | 0.0 | 0.0 |
| Arkansas | 54 | 0 | 1 | 0.0 | 0 | 4 | 0.0 | 0.0 |
| California | 513 | 0 | 4 | 0.0 | 1 | 50 | 0.2 | 0.2 |
| Colorado | 95 | 0 | 1 | 0.0 | 0 | 16 | 0.0 | 0.0 |
| Connecticut | 66 | 1 | 1 | 1.5 | 3 | 17 | 4.5 | 4.1 |
| Dist. of Columbia | 39 | 0 | 3 | 0.0 | 0 | 10 | 0.0 | 0.0 |
| Georgia | 129 | 0 | 2 | 0.0 | 0 | 7 | 0.0 | 0.0 |
| Illinois | 621 | 1 | 4 | 0.2 | 1 | 35 | 0.2 | 0.3 |
| Indiana | 123 | 6 | 1 | 4.0 | 3 | 8 | 4.1 | 6.9 |
| Iowa | 55 | 0 | 1 | 0.0 | 0 | 11 | 0.0 | 0.0 |
| Kansas | 85 | 0 | 1 | 0.0 | 0 | 10 | 0.0 | 0.0 |
| Kentucky | 90 | 0 | 1 | 0.0 | 0 | 4 | 0.0 | 0.0 |
| Louisiana | 226 | 0 | 2 | 0.0 | 1 | 25 | 0.4 | 0.4 |
| Maryland | 101 | 0 | 2 | 0.0 | 0 | 14 | 0.0 | 0.0 |
| Massachusetts | 224 | 1 | 3 | 0.4 | 2 | 18 | 0.9 | 1.3 |
| Michigan | 116 | 0 | 2 | 0.0 | 0 | 20 | 0.0 | 0.0 |
| Minnesota | 248 | 0 | 1 | 0.0 | 0 | 25 | 0.0 | 0.0 |
| Missouri | 265 | 0 | 2 | 0.0 | 0 | 12 | 0.0 | 0.0 |
| Nebraska | 90 | 2 | 2 | 2.2 | 0 | 1 | 0.0 | 2.2 |
| New York | 1,092 | 39 | 9 | 3.6 | 89 | 36 | 7.3 | 10.9 |
| North Carolina | 114 | 0 | 2 | 0.0 | 0 | 17 | 0.0 | 0.0 |
| Ohio | 300 | 0 | 3 | 0.0 | 0 | 14 | 0.0 | 0.0 |
| Oklahoma | 72 | 0 | 1 | 0.0 | 0 | 3 | 0.0 | 0.0 |
| Oregon | 80 | 0 | 1 | 0.0 | 0 | 10 | 0.0 | 0.0 |
| Pennsylvania | 440 | 3 | 6 | 0.7 | 0 | 24 | 0.0 | 0.7 |
| South Carolina | 55 | 0 | 1 | 0.0 | 0 | 6 | 0.0 | 0.0 |
| Tennessee | 110 | 0 | 3 | 0.0 | 0 | 3 | 0.0 | 0.0 |
| Texas | 295 | 2 | 3 | 0.7 | 1 | 12 | 0.3 | 1.0 |
| Utah | 0 | 0 | 0 | 0.0 | 0 | 0 | 0.0 | 0.0 |
| Vermont | 88 | 1 | 1 | 1.1 | 0 | 8 | 0.0 | 1.1 |
| Virginia | 134 | 0 | 2 | 0.0 | 0 | 8 | 0.0 | 0.0 |
| Wisconsin | 143 | 0 | 2 | 0.0 | 0 | 17 | 0.0 | 0.0 |
| Subtotals | 6,101 | 56 | 69 | 0.9 | 94 | 470 | 1.5 | 2.4 |
| States Without Medical Schools | | | | | | | | |
| Arizona | 22 | | | | 3 | 17 | 13.6 | 13.6 |
| Delaware | 18 | | | | 0 | 5 | 0.0 | 0.0 |
| Florida | 131 | | | | 15 | 58 | 2.7 | 2.7 |
| Idaho | 82 | | | | 0 | 31 | 0.0 | 0.0 |
| Maine | 33 | | | | 0 | 12 | 0.0 | 0.0 |
| Mississippi | 30 | | | | 0 | 14 | 0.0 | 0.0 |
| Montana | 0 | | | | 0 | 7 | 0.0 | 0.0 |
| Nevada | 0 | | | | 0 | 1 | 0.0 | 0.0 |
| New Hampshire | 10 | | | | 0 | 5 | 0.0 | 0.0 |
| New Jersey | 102 | | | | 6 | 17 | 5.9 | 5.9 |
| New Mexico | 1 | | | | 0 | 0 | 0.0 | 0.0 |
| North Dakota | 22 | | | | 0 | 0 | 0.0 | 0.0 |
| Rhode Island | 22 | | | | 0 | 10 | 0.0 | 0.0 |
| South Dakota | 10 | | | | 0 | 10 | 0.0 | 0.0 |
| Washington | 116 | | | | 0 | 20 | 0.0 | 0.0 |
| West Virginia | 48 | | | | 0 | 17 | 0.0 | 0.0 |
| Wyoming | 0 | | | | 0 | 0 | 0.0 | 0.0 |
| Territories & Poss. | 58 | | | | 2 | 35 | 3.4 | 3.4 |
| Subtotals | 943 | | | | 26 | 265 | 2.8 | 2.8 |

TABLE 9.—Failures Before Medical Licensing Boards by Licentiates, 1947

| Licensees Licensed by Examination, Reciprocity or Endorsement | Approved Schools | | | | Foreign Schools | | | | Unapproved Medical Schools and Schools of Osteopathy | | | | Total Failures by Licentiates, 1947 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Licensed After One Failure | | Licensed After Two or More Failures | | Licensed After One Failure | | Licensed After Two or More Failures | | Licensed After One Failure | | Licensed After Two or More Failures | | |
| | Failed in State Before Licensed | Licensed | Failed in State Before Licensed | Licensed | Failed in State Before Licensed | Licensed | Failed in State Before Licensed | Licensed | Failed in State Before Licensed | Licensed | Failed in State Before Licensed | Licensed | |
| Alabama | 1 | 1 | 1 | 1 | | | | | | | | | 3 |
| Arizona | | | | | | | | | | | | | |
| Arkansas | | | | | | | | | | | | | |
| California | 1,022 | | | | | | | | | | | | 1,022 |
| Colorado | 1,022 | | | | | | | | | | | | 1,022 |
| Connecticut | 252 | | | | | | | | | | | | 252 |
| Delaware | 226 | | | | | | | | | | | | 226 |
| District of Columbia | 226 | | | | | | | | | | | | 226 |
| Florida | 226 | | | | | | | | | | | | 226 |
| Georgia | 226 | | | | | | | | | | | | 226 |
| Idaho | 226 | | | | | | | | | | | | 226 |
| Illinois | 226 | | | | | | | | | | | | 226 |
| Indiana | 226 | | | | | | | | | | | | 226 |
| Iowa | 226 | | | | | | | | | | | | 226 |
| Kansas | 226 | | | | | | | | | | | | 226 |
| Kentucky | 226 | | | | | | | | | | | | 226 |
| Louisiana | 226 | | | | | | | | | | | | 226 |
| Maine | 226 | | | | | | | | | | | | 226 |
| Maryland | 226 | | | | | | | | | | | | 226 |
| Massachusetts | 226 | | | | | | | | | | | | 226 |
| Michigan | 226 | | | | | | | | | | | | 226 |
| Minnesota | 226 | | | | | | | | | | | | 226 |
| Mississippi | 226 | | | | | | | | | | | | 226 |
| Missouri | 226 | | | | | | | | | | | | 226 |
| Montana | 226 | | | | | | | | | | | | 226 |
| Nebraska | 226 | | | | | | | | | | | | 226 |
| Nevada | 226 | | | | | | | | | | | | 226 |
| New Hampshire | 226 | | | | | | | | | | | | 226 |
| New Jersey | 226 | | | | | | | | | | | | 226 |
| New Mexico | 226 | | | | | | | | | | | | 226 |
| New York | 1,545 | | | | | | | | | | | | 1,545 |
| North Carolina | 226 | | | | | | | | | | | | 226 |
| North Dakota | 226 | | | | | | | | | | | | 226 |
| Ohio | 226 | | | | | | | | | | | | 226 |
| Oklahoma | 226 | | | | | | | | | | | | 226 |
| Oregon | 226 | | | | | | | | | | | | 226 |
| Pennsylvania | 226 | | | | | | | | | | | | 226 |
| Rhode Island | 226 | | | | | | | | | | | | 226 |
| South Carolina | 226 | | | | | | | | | | | | 226 |
| South Dakota | 226 | | | | | | | | | | | | 226 |
| Tennessee | 226 | | | | | | | | | | | | 226 |
| Texas | 226 | | | | | | | | | | | | 226 |
| Utah | 226 | | | | | | | | | | | | 226 |
| Vermont | 226 | | | | | | | | | | | | 226 |
| Virginia | 226 | | | | | | | | | | | | 226 |
| West Virginia | 226 | | | | | | | | | | | | 226 |
| Wisconsin | 226 | | | | | | | | | | | | 226 |
| Wyoming | 226 | | | | | | | | | | | | 226 |
| Dist. Columbia and Possessions | 104 | | | | | | | | | | | | 104 |
| Totals | 14,479 | | | | | | | | | | | | |

once and after two or more failures, and the table indicates whether the single and multiple failures have been in the state where licensed or elsewhere. The total number of candidates in 1947 examined and licensed

In the group representing graduates of approved medical schools, 380 of those licensed had previously failed a state board examination. One hundred and forty had one failure before being licensed in a given

TABLE 9.—*Reciprocity and Endorsement*

| Marginal Number | The Examining Board of | Reciprocates with, or Endorses Certificates Granted by: Alabama | Arizona | Arkansas | California | Colorado | Connecticut | Delaware | Dist. of Columbia | Florida | Georgia | Idaho | Illinois | Indiana | Iowa | Kansas | Kentucky | Louisiana | Maine | Maryland | Massachusetts | Michigan | Minnesota | Mississippi | Missouri | Montana | Nebraska | Nevada | New Hampshire | New Jersey | New Mexico | Marginal Number |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Alabama | .. | .. | + | + | + | .. | + | + | .. | + | .. | + | + | + | + | + | + | + | + | .. | + | + | + | + | + | + | + | .. | + | + | 1 |
| 2 | Arizona | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 2 |
| 3 | Arkansas (regular board) | + | .. | + | + | + | + | + | + | .. | + | .. | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | .. | + | + | + | 3 |
| 4 | California | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 4 |
| 5 | Colorado | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 5 |
| 6 | Connecticut (reg. & homeo. bds.) | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 6 |
| 7 | Delaware (regular board) | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 7 |
| 8 | District of Columbia | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 8 |
| 9 | Florida | No reciprocity or endorsement policies | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 9 |
| 10 | Georgia | + | .. | + | + | + | .. | .. | .. | + | .. | .. | .. | + | + | + | + | + | + | + | .. | + | + | + | + | + | + | + | .. | + | + | 10 |
| 11 | Idaho | No reciprocal relations | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 11 |
| 12 | Illinois | + | .. | + | + | + | .. | .. | .. | .. | .. | .. | .. | + | + | + | + | + | + | + | .. | + | + | + | + | + | + | + | .. | + | + | + | 12 |
| 13 | Indiana | + | .. | + | + | + | .. | .. | .. | + | .. | .. | [22] | .. | + | + | + | + | + | + | .. | + | + | + | + | + | + | + | .. | + | + | + | 13 |
| 14 | Iowa | + | .. | + | + | + | .. | + | + | + | .. | .. | + | + | .. | + | + | + | + | + | .. | + | + | + | + | + | + | + | .. | + | + | + | 14 |
| 15 | Kansas | + | .. | +[19] | + | .. | + | + | + | + | .. | .. | + | + | + | .. | + | + | + | + | .. | + | + | + | + | + | + | + | .. | + | + | + | 15 |
| 16 | Kentucky | + | .. | + | + | + | .. | + | + | + | .. | .. | + | + | + | + | .. | + | + | + | .. | + | + | + | + | + | + | + | .. | + | + | + | 16 |
| 17 | Louisiana (reg. & homeo. bds.) | + | .. | + | + | + | .. | + | + | + | .. | .. | + | + | + | + | + | .. | + | + | .. | + | + | + | + | + | + | + | .. | + | + | + | 17 |
| 18 | Maine | .. | .. | + | + | + | .. | + | + | + | .. | .. | + | + | + | + | + | + | .. | + | .. | + | + | + | + | + | + | + | .. | + | + | + | 18 |
| 19 | Maryland (reg. & homeo. bds.) | + | .. | + | + | + | .. | + | + | + | .. | .. | + | + | + | + | + | + | + | .. | .. | + | + | + | + | + | + | + | .. | + | + | + | 19 |
| 20 | Massachusetts | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | + | .. | .. | .. | .. | .. | .. | .. | .. | .. | 20 |
| 21 | Michigan | + | + | + | + | + | + | + | + | + | .. | .. | + | + | + | + | + | + | + | + | .. | + | .. | + | + | + | + | + | + | + | + | + | 21 |
| 22 | Minnesota | + | + | + | + | + | + | + | .. | + | .. | .. | .. | + | + | .. | + | + | + | + | .. | + | + | .. | + | + | + | + | + | + | + | + | 22 |
| 23 | Mississippi | + | + | + | + | + | + | + | .. | + | .. | .. | + | + | + | + | + | + | + | + | .. | + | + | + | .. | + | + | + | + | + | + | + | 23 |
| 24 | Missouri | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | + | .. | + | + | + | + | + | + | .. | + | + | + | + | .. | + | + | .. | + | + | + | 24 |
| 25 | Montana | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 25 |
| 26 | Nebraska | + | + | + | + | + | + | + | + | .. | + | .. | + | + | + | + | + | + | + | + | .. | + | + | + | + | + | + | + | + | + | + | + | 26 |
| 27 | Nevada | .. | .. | +[21] | + | .. | .. | .. | .. | .. | + | .. | + | + | + | + | + | + | + | + | .. | + | + | + | + | + | + | + | .. | + | .. | .. | 27 |
| 28 | New Hampshire | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 28 |
| 29 | New Jersey | .. | .. | .. | + | + | .. | .. | + | .. | + | .. | + | + | + | + | + | + | + | + | .. | + | .. | + | .. | .. | .. | .. | .. | + | .. | .. | 29 |
| 30 | New Mexico | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 30 |
| 31 | New York | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 31 |
| 32 | North Carolina | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 32 |
| 33 | North Dakota | + | .. | + | + | + | .. | .. | .. | .. | .. | .. | + | + | + | + | + | + | + | + | .. | + | + | + | + | + | + | + | .. | + | + | + | 33 |
| 34 | Ohio | + | + | + | + | + | + | + | + | + | + | .. | + | + | + | + | + | + | + | + | .. | + | + | + | + | + | + | + | .. | + | + | + | 34 |
| 35 | Oklahoma | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 35 |
| 36 | Oregon | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 36 |
| 37 | Pennsylvania | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 37 |
| 38 | Rhode Island | .. | .. | .. | .. | .. | .. | [11] | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | [10] | .. | .. | .. | [10] | .. | .. | .. | .. | .. | [11] | .. | .. | 38 |
| 39 | South Carolina | + | .. | .. | .. | .. | .. | .. | + | + | + | .. | .. | .. | .. | .. | + | + | + | + | .. | + | .. | .. | .. | .. | .. | .. | + | .. | + | .. | 39 |
| 40 | South Dakota | + | .. | .. | .. | .. | .. | .. | + | .. | + | .. | .. | .. | .. | .. | + | + | + | + | .. | + | + | + | + | .. | + | + | .. | + | .. | + | 40 |
| 41 | Tennessee | + | + | + | + | + | .. | + | .. | + | .. | .. | + | + | + | + | + | + | + | + | .. | + | + | + | + | .. | + | + | .. | + | + | + | 41 |
| 42 | Texas | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 42 |
| 43 | Utah | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 43 |
| 44 | Vermont | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 44 |
| 45 | Virginia | .. | .. | + | .. | .. | + | + | .. | .. | .. | .. | .. | + | + | + | + | + | .. | + | .. | + | + | + | .. | + | .. | + | .. | + | + | + | 45 |
| 46 | Washington | + | .. | + | + | .. | .. | .. | .. | .. | .. | .. | + | .. | + | + | + | + | + | + | .. | + | + | + | + | + | + | + | .. | .. | .. | .. | 46 |
| 47 | West Virginia | + | .. | + | .. | .. | + | + | .. | + | .. | .. | + | + | + | + | + | + | + | + | .. | + | + | + | + | + | + | + | .. | + | + | + | 47 |
| 48 | Wisconsin | + | + | + | + | + | + | + | .. | + | .. | .. | + | + | + | + | + | + | + | + | .. | + | + | + | + | + | + | + | .. | + | + | + | 48 |
| 49 | Wyoming | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 49 |
| 50 | Alaska | + | .. | + | + | + | .. | + | .. | .. | .. | .. | .. | + | .. | + | .. | .. | + | .. | .. | + | + | .. | + | .. | .. | + | .. | .. | + | .. | .. | 50 |
| 51 | Hawaii | No reciprocal relations | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 51 |
| 52 | Puerto Rico | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 52 |

This summary should be supplemented by direct communication with the

Some states have additional requirements for graduates of schools outside the United States and Canada.

+, indicates reciprocal or endorsement relationships have been established; .. indicates no reciprocal or endorsement relationships have been established. (See column—"At the discretion of the board.")

1. 1st P, first papers required; @, in citizenship column indicates full citizenship required.
2. In most cases there is a small additional recording or registration fee.
3. Year of practice after internship required.
4. Internship accepted in lieu of one year's practice.
5. Professional practice required.
6. All applicants must be graduates of a medical school approved by the American Medical Association.
7. Just preceding application.
8. No basic science reciprocity—examination must be within the state.
9. Basic science certificate required either by reciprocity or examination in addition to basic science subjects of National Board.
10. Canadian citizens are required to file first papers.
11. Leading medical schools of Great Britain recognized.
12. Oral examination required when original license is ten or more years old.
13. Applicant must have resided in the state used as basis of application for one year after date on said certificate, or show two years of licensed practice in some other state.
14. Oral examination required.
15. Unless in practice in another state for five years.
16. Actual practice for a period of three years immediately preceding date of application.
17. Practical, clinical examination required.
18. Foreign graduates only.
19. Regular and Homeopathic boards.
20. Reciprocity is extended to all states which accept Oregon licentiates on reciprocity basis.
21. Regular board.
22. Fee same as applicant's state charges if more than $50.

or granted licenses by reciprocity or endorsement of credentials is shown as well as the total number of failures in all groups.

In 1947 there were 14,429 licenses to practice medicine issued. Of these, 662 were issued to applicants who had previously been unsuccessful before a licensing board.

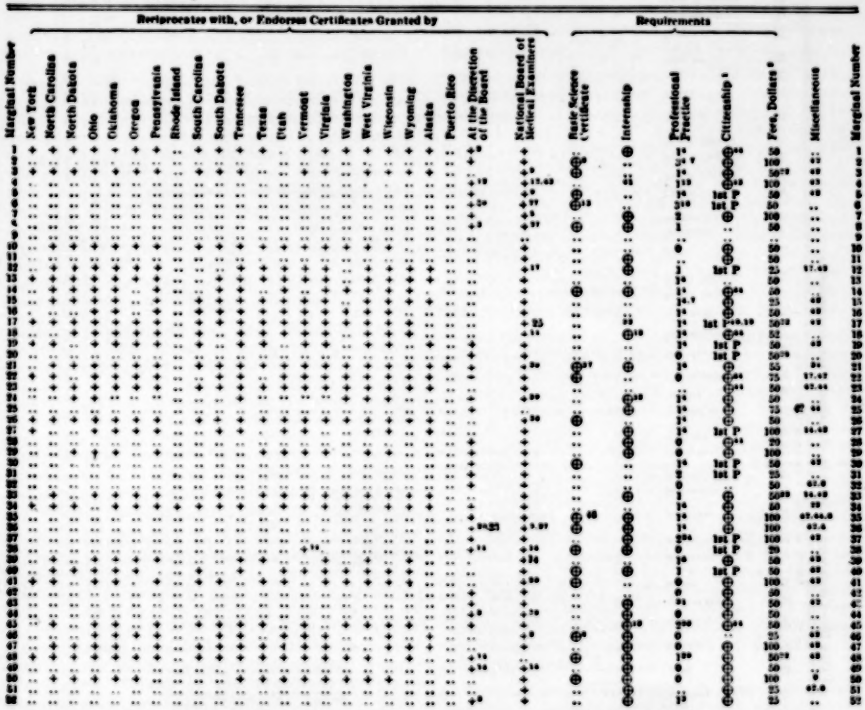
state, and 143 were licensed after one failure in a state other than the one in which they were licensed. Of 97 who received licenses after more than one failure, 51 were registered in the original state and 35 elsewhere; 11 had failed both in the state where finally licensed and elsewhere.

One hundred and fifty-seven graduates of foreign faculties of medicine and 125 graduates of unapproved medical schools and schools of osteopathy were licensed after

## REGISTRATION BY RECIPROCITY AND ENDORSEMENT

The reciprocity and endorsement policies in effect in the United States, Alaska,

*Policies of Medical Licensing Boards*




secretary of the licensing board of the state in which the physician is interested.

23. Oral examination required if applicant's state requires it.
24. If the applicant passes the examination in the state from which he transfers after the completion of his internship, no practice is required.
25. License in state with which Louisiana reciprocates required.
26. Internship accepted—considered equivalent to two years' practice.
27. Fee $25.
28. Fee for license on basis of National Board certificate, $35.
29. A two year internship is accepted.
30. Diplomates of National Board not required to have been in practice for three years.
31. Same as required of Utah candidates applying for licensure.
32. Clinical examination required.
33. Reciprocity applicants only.
34. Supplemental examination required in certain cases when accepting the examination of a state with whom reciprocal relations have not been established.
35. May be licensed after a special (written) supplemental examination.
36. Fee $50.
37. For matriculants after Oct. 15, 1937.
38. Fee, $20.
39. Fee, $15.
40. Permanent license withheld until completion of citizenship.
41. Graduates of foreign medical schools effective Sept. 15, 1935. Canadian schools exempted effective Sept. 15, 1938.
42. Graduates of foreign medical schools are not accepted.
43. Graduates of foreign medical schools must have fulfilled all requirements of California prior to admittance to examination for any certificate used as basis of application to California.
44. Not applicable to citizens of Canada.
45. Not required if country in which applicant is licensed will admit to practice citizens of the United States licensed to practice in some state or upon proof of requirements similar to those required by California of graduates of foreign medical schools.
46. Not required for licensure by reciprocity.

previous failure. Among those with multiple failures in these two groups were several that had more than five unsuccessful tests before attaining licensure.

In eight states all physicians licensed last year had no failures in a state medical examination.

Hawaii and Puerto Rico are summarized in table 9. Florida, Idaho and Hawaii have not established reciprocal agreements with regard to medical licensure. Nevada, which on Aug. 5, 1946 temporarily suspended all reciprocity and endorsement privileges, reinstated this method of licensure in 1947. Idaho and Hawaii

## TABLE 10.—*Candidates Licensed by Reciprocity and Endorsement*

| State Issuing License by Reciprocity or Endorsement | Original Number | Total Licensed | Source of Former License or Credentials | | |

endorse diplomates of the National Board of Medical Examiners. Florida is the only state which requires a written examination of all applicants for licensure. Those desiring licenses by reciprocity or endorsement in seventeen states, the District of Columbia and Alaska are required to obtain a certificate from the state board of examiners in the basic sciences before being eligible for medical licensure.

Twenty-eight states and Alaska have definite reciprocal agreements with specific states. Thirty states, including ten which have specific reciprocity agreements, and Puerto Rico, are given discretionary powers under the medical practice act. These thirty states will register physicians who present credentials which correspond with those required by their respective states at the time such licenses are issued. The states in which diplomates of the National Board of Medical Examiners are accepted for licensure on the basis of these credentials are also indicated.

Specific requirements, such as professional practice, oral examination and internship, are recorded, as is also the fee for a license without written examination. Citizenship prerequisites are mentioned. In some states physicians of Canadian birth are exempt from the citizenship requirement. This is indicated by footnote. Few states will accept graduates of foreign faculties of medicine on a reciprocal basis. Additional requisites or exemptions are included in footnotes.

This chart will be available in reprint form. It is helpful to physicians who are contemplating locating in another state. The facts recorded in this table are intended to present merely general statements of licensure policies. The information here given should be supplemented by direct communication with the secretary of the licensing board. A list of the executive officers in charge of medical licensure appears elsewhere in this study.

The credentials presented by physicians granted licenses to practice medicine and surgery without written examination are given in table 10. There were 7,682 so registered on the basis of licenses from other states, the District of Columbia, the territories or possessions or foreign countries, the certificate of the National Board of Medical Examiners, also the government services and special exemption. The 7,682 licensed by this method exceeded those so licensed in any previous year except 1946. The number securing licenses by reciprocity or endorsement has been steadily increasing but not to the extent which was evident in 1946 and 1947.

California issued 1,328 licenses by this method and New York registered 1,035. Three other states endorsed more than 300 candidates, namely, Massachusetts, Ohio and Texas. While the number registered was fewer than in 1946, some states issued more by this method of licensure in 1947 than in 1946. The largest number of candidates presenting the same type of credential were the 2,312 diplomates of the National Board of Medical Examiners. On the basis of this certificate 702 were licensed in New York, 272 in Massachusetts and 244 in California.

More than 450 presented licenses in Illinois and New York. The greatest number presenting a like state license were 205 Illinois licentiates who secured licenses in California. Other states registered 130 applicants holding California licenses, while that state registered on credentials 1,328 physicians from other states. In contrast with California, 540 licentiates of Illinois were licensed in other states while it endorsed 271 physicians. Arizona, Idaho, Nevada, New Mexico, North Dakota and South Dakota each had fewer than five licentiates registered in other states last year.

One hundred and seventy-eight medical officers of one of the government services received licenses by endorsement in seven states: California 56, Illinois 10, New York 1, Rhode Island 12, Texas 8, Virginia 4, and Wisconsin 87. Four physicians who were legal residents of Pennsylvania and were qualified to take the state board examination but were prevented from doing so by their service in the armed forces were licensed in Pennsylvania under the provisions of Act 132, approved April 25, 1945. Thirteen physicians were licensed in six states on credentials from one of the possessions of the United States, and sixteen on the basis of Canadian or foreign licenses. The three homeopathic boards licensed 6 physicians by reciprocity—Connecticut 3, Delaware 1 and Maryland 2.

Table 11 records the numbers from individual schools represented by the 7,682 reciprocity licentiates. Every approved medical school in the United States had graduates licensed without examination in 1947. More than 200 graduates of five schools sought such licensure. The distribution of the figures on this table reflects the movement of physicians to states other than the one in which they obtained their professional training.

One hundred and thirty-five graduates of foreign medical schools obtained endorsement of state licenses in twenty-one states and Puerto Rico, and 185 graduates of schools no longer in operation were registered in thirty-three states and Hawaii. The majority of these licentiates were graduates of Rush Medical College, which ceased to teach undergraduate medical students a few years ago. No graduates of unapproved medical schools were accepted for reciprocal registration. The figures include 111 osteopaths licensed in eight states.

TABLE 11.—*Candidates Licensed by*

| Marginal Number | SCHOOL | Alabama / Arizona / Arkansas | California / Colorado | Connecticut | Delaware | Dist. of Columbia / Florida | Georgia / Idaho | Illinois | Indiana | Iowa | Kansas | Kentucky | Louisiana | Maine | Maryland | Massachusetts | Michigan | Minnesota | Marginal Number |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **ALABAMA** | | | | | | | | | | | | | | | | | | |
| 1 | Med. Col. of Alabama | . .. | 1 . | . | | .. | 1 . | . | . | . | . | . | . | . | . | . | . | . | 1 |
| | **ARKANSAS** | | | | | | | | | | | | | | | | | | |
| 2 | Univ. of Arkansas | 1 .. | 10 . | 1 . | 1 . | 1 . | 3 . | 5 | 1 | 2 | 1 . | 2 | . | 1 . | 2 | . | 2 | | |
| | **CALIFORNIA** | | | | | | | | | | | | | | | | | | |
| 3 | Col. of Med. Evangelists | . 1 . | 36 3 | 1 . | 3 . | .. | 2 | 1 | 1 | 2 . | . | . | 6 | 1 | 1 | 1 | 3 | 4 | |
| 4 | Stanford Univ. | . .. | 9 . | . . | 3 . | .. | 1 | . | 1 . | 1 . | . | . | 1 | 1 | 3 | 3 | 4 | | |
| 5 | Univ. of California | . .. | 2 . | . . | 1 . | .. | . | . | . | . . | . | . | . | 3 | . | . | 5 | | |
| 6 | Univ. of Southern California | 1 1 . | 4 1 | . . | . . | .. | 2 | . | . | 1 . | . | . | 1 | . | . | 1 | 6 | | |
| | **COLORADO** | | | | | | | | | | | | | | | | | | |
| 7 | Univ. of Colorado | . 2 . | 15 2 | . | .. | .. | 1 | . | 5 | 1 | 2 | 1 | . | 1 | . | . | 2 | 7 | |
| | **CONNECTICUT** | | | | | | | | | | | | | | | | | | |
| 8 | Yale Univ. | .. | 11 . | 24 . | 5 . | 3 . | 4 | . | . | 2 | 1 | 2 | 3 . | 5 | 1 | 6 | 8 | | |
| | **DISTRICT OF COLUMBIA** | | | | | | | | | | | | | | | | | | |
| 9 | George Washington Univ. | 1 .. | 17 . | 4 . | 32 . | 1 2 | 1 | 4 | . | 1 | 1 | . | 1 | 19 . | 1 | . | 9 | | |
| 10 | Georgetown Univ. | .. | 10 . | 3 . | 22 . | 1 . | . | 1 | . | . | . | 3 | . | 11 | 9 | 1 | 1 | 10 | |
| 11 | Howard Univ. | .. | 8 . | 1 . | 2 . | 2 . | 1 | 1 | . | . | . | 3 | . | 1 . | 4 | . | 11 | | |
| | **GEORGIA** | | | | | | | | | | | | | | | | | | |
| 12 | Emory Univ. | 6 . 2 | 3 . | 1 . | 2 . | 1 . | . | . | . | . | . | 2 | . | . | 2 | . | 12 | | |
| 13 | Univ. of Georgia | 1 .. | 5 . | . . | .. | .. | . | . | . | . | 1 | 4 | . | 1 . | 1 | 13 | | | |
| | **ILLINOIS** | | | | | | | | | | | | | | | | | | |
| 14 | Loyola Univ. | . 1 . | 25 . | 1 . | 1 . | .. | 4 | 6 | 4 | 1 . | . | . | . | . | . | . | 2 | 14 | |
| 15 | Northwestern Univ. | 3 4 . | 45 6 | . . | 2 . | 1 . | 17 | 10 | 5 | 6 | 2 | 1 | . | 2 | 3 | 11 | 6 | 15 | |
| 16 | Univ. of Chicago | 1 1 . | 9 4 | 1 . | 1 . | .. | 12 | 7 | 3 | 1 | 1 | . | . | 6 | 1 | 4 | 3 | 16 | |
| 17 | Univ. of Illinois | 1 3 1 | 119 2 | 1 . | 3 . | 1 . | 18 | 15 | 5 | . | . | 1 | 1 | 2 . | 8 | 1 | 17 | | |
| | **INDIANA** | | | | | | | | | | | | | | | | | | |
| 18 | Indiana Univ. | . 3 2 | 19 2 | . . | 3 . | 1 . | 8 | 2 | 1 | 1 | 3 | 1 | . | . . | 13 | . | 18 | | |
| | **IOWA** | | | | | | | | | | | | | | | | | | |
| 19 | State Univ. of Iowa | 3 1 1 | 17 7 | 1 . | 3 . | .. | 10 | 2 | 24 | 3 . | 2 | . | . | 1 | 8 | 4 | 19 | | |
| | **KANSAS** | | | | | | | | | | | | | | | | | | |
| 20 | Univ. of Kansas | . 1 2 | 24 6 | 3 . | . . | .. | 6 | 4 | 6 . | 8 | 2 | . | 1 | 1 | 3 | . | 20 | | |
| | **KENTUCKY** | | | | | | | | | | | | | | | | | | |
| 21 | Univ. of Louisville | 2 2 2 | 17 1 | 1 1 | 1 . | .. | 1 | 13 | 3 . | 2 | 2 | . | 5 . | 8 | . | 21 | | | |
| | **LOUISIANA** | | | | | | | | | | | | | | | | | | |
| 22 | Louisiana State Univ. | 6 . 1 | 8 1 | 1 . | 1 . | 2 . | 1 | . | . | . | 1 | . | 1 . | 1 | 22 | | | | |
| 23 | Tulane Univ. of Louisiana | 20 1 3 | 12 1 | . . | . . | 4 . | 4 | 3 | . | 2 | 1 | 6 | . | . 2 | 3 | 4 | 23 | | |
| | **MARYLAND** | | | | | | | | | | | | | | | | | | |
| 24 | Johns Hopkins Univ. | 1 3 1 | 16 3 | 8 . | 8 . | 2 . | 4 | 2 | 1 . | 2 | 1 | . | 4 | 7 | 5 | 1 | | | |
| 25 | Univ. of Maryland | 1 .. | 13 . | 2 1 | 11 . | 1 . | 1 | 1 | . | 1 | 2 . | . | 3 | 3 | 2 . | 24 | | | |
| | **MASSACHUSETTS** | | | | | | | | | | | | | | | | | | |
| 26 | Boston Univ. | .. | 10 . | 8 1 | .. | .. | . | 1 . | . | 1 | 26 | | | | | | | | |
| 27 | Harvard Med. Sch. | . 1 . | 22 1 | 12 . | 3 . | 2 . | 9 | 1 . | 6 | 2 . | 3 | 3 | 68 | 4 | 7 | 27 | | | |
| 28 | Tufts Col. | .. | 22 . | 11 . | 4 . | .. | 4 | 1 . | 1 | 2 . | 13 . | 95 | . | 1 | 28 | | | | |
| | **MICHIGAN** | | | | | | | | | | | | | | | | | | |
| 29 | Univ. of Michigan | 1 2 . | 30 2 | 2 . | 6 . | .. | 8 | 4 | 3 | 1 | 1 | 4 . | 1 | 2 | 3 | 4 | 29 | | |
| 30 | Wayne Univ. | . 2 . | 34 . | . . | 2 . | .. | 3 | 1 | . | . | . | 2 . | 1 | 3 | . | 2 | 30 | | |
| | **MINNESOTA** | | | | | | | | | | | | | | | | | | |
| 31 | Univ. of Minnesota | 1 1 . | 76 5 | 2 . | .. | .. | 8 | 1 | 2 . | 1 | . | . | 1 | 2 | 16 | 4 | 31 | | |
| | **MISSOURI** | | | | | | | | | | | | | | | | | | |
| 32 | St. Louis Univ. | . 3 . | 33 3 | 2 . | 2 . | .. | 23 | 5 | 2 | 5 . | . | 1 | 2 | 1 | 4 | 7 | 32 | | |
| 33 | Washington Univ. | 8 1 1 | 17 2 | 1 . | 3 . | 2 . | 20 | 3 | 3 | 3 | 1 | 5 | . | 3 | 2 | 3 | 1 | 33 | |
| | **NEBRASKA** | | | | | | | | | | | | | | | | | | |
| 34 | Creighton Univ. | .. 3 . | 16 4 | . . | . . | .. | 4 | . | 7 | 2 . | 1 | . | . | 1 | 4 | 1 | 34 | | |
| 35 | Univ. of Nebraska | . 1 . | 29 4 | 1 . | 1 2 | .. | 6 | 4 | 7 | 4 . | 1 | . | . | 3 | 7 | 3 | 35 | | |
| | **NEW YORK** | | | | | | | | | | | | | | | | | | |
| 36 | Albany Med. Col. | .. . . | 5 1 | 4 1 | 1 . | .. | 1 | . | . | . | . | . | 3 | 1 | . | 36 | | | |
| 37 | Columbia Univ. | . 2 1 | 26 5 | 21 . | 2 . | 1 1 | 3 | . | 1 | 3 . | . | 1 | 4 | 15 | 2 | 2 | 37 | | |
| 38 | Cornell Univ. | . . 1 | 12 2 | 3 . | 3 . | .. | 1 | . | 1 | . | 1 | . | 3 | 4 | 2 | . | 38 | | |
| 39 | Long Island Col. | . . . | 15 1 | 11 . | 1 . | 1 . | 1 | 2 | . | . | 2 | . | 1 | 1 | 5 | 3 | 2 | 39 | |
| 40 | New York Med. Col. | . 1 . | 13 . | 7 . | 4 . | 1 . | 1 | . | . | . | . | . | . | 5 | 1 | 2 | 40 | | |
| 41 | New York Univ. | . 4 . | 43 1 | 8 . | 5 . | 1 1 | 2 | 1 | 2 . | 1 | 1 | . | 5 | 7 | 1 | 2 | 41 | | |
| 42 | Syracuse Univ. | . 1 . | 7 1 | 1 . | . . | .. | . | . | . | . | . | . | 1 | 5 | 1 | . | 42 | | |
| 43 | Univ. of Buffalo | . 2 . | 16 . | 2 . | . . | . 2 | 6 | 1 | 1 | . | . | 1 | 2 | 1 | . | 1 | 43 | | |
| 44 | Univ. of Rochester | .. . | 10 . | 2 . | 1 . | . 1 | 1 | 2 | 2 . | 1 | 2 | . | 2 | 5 | 1 | . | 44 | | |
| | | 1 2 3 | 4 5 | 6 7 | 8 9 | 10 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | | |

| Marginal Number | Mississippi | Missouri | Montana | Nebraska | Nevada | New Hampshire | New Jersey | New Mexico | New York | North Carolina | North Dakota | Ohio | Oklahoma | Oregon | Pennsylvania | Rhode Island | South Carolina | South Dakota | Tennessee | Texas | Utah | Vermont | Virginia | Washington | West Virginia | Wisconsin | Wyoming | Alaska, Hawaii and Puerto Rico | Totals | Marginal Number |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 2 | 1 |
| 2 | . | 5 | . | . | . | . | 3 | . | 2 | 1 | . | 1 | 4 | . | . | . | . | . | 1 | 3 | . | . | 1 | . | . | 1 | . | . | 52 | 2 |
| 3 | 1 | 1 | 3 | 1 | . | . | 1 | . | 4 | 2 | 1 | 3 | . | 5 | . | . | . | . | 2 | 3 | . | . | 2 | 9 | 2 | . | 1 | 5 | 105 | 3 |
| 4 | . | . | . | . | 2 | . | . | . | 2 | . | . | . | . | 1 | . | . | . | . | 1 | . | . | . | . | 6 | . | . | . | . | 34 | 4 |
| 5 | 1 | 1 | . | . | . | . | 2 | . | 3 | 1 | . | . | . | 1 | 1 | . | . | . | . | . | 2 | . | 1 | 2 | . | 3 | . | . | 24 | 5 |
| 6 | . | 1 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 13 | 6 |
| 7 | . | 1 | 4 | 1 | . | . | . | 4 | 4 | . | . | . | . | 3 | 2 | . | . | . | . | 1 | . | 1 | 1 | 4 | 1 | . | 1 | 1 | 61 | 7 |
| 8 | . | 1 | . | . | . | 2 | 3 | 1 | 17 | 1 | 1 | 3 | 2 | . | 6 | 2 | . | . | . | 2 | . | 4 | 2 | 1 | . | . | . | 1 | 116 | 8 |
| 9 | . | 2 | . | . | . | . | 3 | 1 | 9 | 3 | . | 5 | . | . | 3 | . | . | . | . | 3 | . | . | 25 | 3 | . | 4 | . | 1 | 137 | 9 |
| 10 | . | . | 1 | 1 | 1 | 1 | 5 | 1 | 17 | . | . | 2 | 1 | 1 | 5 | 1 | 1 | . | 1 | 1 | . | . | 9 | 3 | . | . | 1 | 1 | 113 | 10 |
| 11 | 1 | 1 | . | . | . | . | 6 | . | 5 | 2 | . | 3 | 1 | . | 2 | 1 | 1 | . | . | . | . | . | 6 | . | . | 1 | . | 2 | 54 | 11 |
| 12 | 1 | 1 | . | . | . | . | 2 | . | 2 | 8 | . | 1 | . | . | . | . | 5 | . | 1 | 2 | . | . | 2 | . | . | . | . | . | 42 | 12 |
| 13 | . | . | . | . | . | . | . | . | . | 8 | . | . | . | . | . | . | 6 | . | . | 1 | . | . | 3 | 1 | . | . | . | . | 33 | 13 |
| 14 | 1 | 1 | 1 | . | . | . | 1 | 2 | 4 | 1 | 1 | 4 | 1 | . | . | . | . | . | . | 6 | . | . | . | 2 | 1 | 4 | . | 1 | 36 | 14 |
| 15 | 1 | 8 | 4 | 2 | . | . | 2 | 3 | 4 | 1 | . | 5 | 2 | 3 | 2 | . | . | 4 | 1 | 13 | 1 | . | 2 | 8 | 1 | 11 | . | 1 | 199 | 15 |
| 16 | . | . | 2 | 3 | . | . | . | 1 | 1 | . | . | 3 | . | 1 | . | . | . | . | 1 | 5 | 1 | . | . | 2 | . | 4 | . | 1 | 81 | 16 |
| 17 | 2 | . | 4 | 1 | 1 | . | . | 4 | 3 | 2 | 3 | 3 | . | 3 | 3 | . | . | . | 3 | 16 | 1 | . | 3 | 4 | . | 17 | . | . | 255 | 17 |
| 18 | . | 4 | . | . | . | . | 2 | . | 13 | 1 | 1 | 6 | . | 3 | 1 | . | . | . | 1 | 11 | . | . | . | . | . | . | . | . | 109 | 18 |
| 19 | . | 3 | 1 | 1 | . | . | . | 2 | 5 | 3 | 2 | 5 | 2 | 6 | . | . | . | 2 | . | 9 | 1 | . | . | 5 | 2 | 4 | 1 | . | 139 | 19 |
| 20 | . | 36 | . | . | . | 1 | . | 1 | . | 1 | 1 | 5 | 1 | 3 | 1 | . | . | 3 | 1 | 7 | . | . | 1 | . | . | 1 | . | . | 123 | 20 |
| 21 | 1 | 6 | . | 1 | . | . | 1 | 1 | 4 | 4 | . | 11 | 1 | 2 | 1 | . | 1 | 2 | 1 | 9 | 1 | . | 5 | 4 | 2 | 4 | 2 | . | 125 | 21 |
| 22 | 11 | . | . | . | . | . | . | . | 3 | 1 | 1 | . | 1 | . | . | . | 1 | . | . | 11 | 1 | . | . | 1 | . | 1 | . | . | 67 | 22 |
| 23 | 4 | 2 | . | 1 | . | . | 5 | 4 | 17 | 6 | . | 3 | 5 | 1 | 1 | . | . | . | 4 | 41 | . | . | 3 | 2 | 1 | 1 | . | . | 169 | 23 |
| 24 | 1 | 2 | . | 1 | . | 1 | 4 | . | 19 | 9 | . | 6 | 1 | . | 5 | . | 2 | 1 | 3 | . | 1 | . | 3 | 6 | . | 1 | . | 1 | 136 | 24 |
| 25 | 2 | 1 | . | . | . | 2 | 14 | 2 | 16 | 2 | . | 8 | 2 | 1 | 5 | . | 1 | . | . | 4 | . | 1 | 6 | 1 | 6 | 1 | . | . | 117 | 25 |
| 26 | . | 1 | . | . | . | 6 | 1 | . | 13 | 2 | . | 1 | . | . | . | 1 | 1 | . | . | 2 | . | . | . | . | 1 | . | . | 5 | 113 | 26 |
| 27 | . | 6 | . | 1 | . | 9 | 3 | 1 | 31 | 12 | . | 6 | . | 4 | 10 | 2 | 1 | . | 1 | 3 | 1 | 1 | 2 | 7 | . | 3 | 2 | 1 | 251 | 27 |
| 28 | . | 1 | . | . | . | 7 | 2 | . | 17 | 3 | . | 2 | . | 2 | 1 | 7 | 1 | . | 1 | 1 | . | . | 2 | . | 1 | 2 | . | . | 203 | 28 |
| 29 | 2 | 2 | 2 | . | . | 1 | 4 | . | 14 | 1 | 3 | 14 | . | . | 4 | 7 | . | . | 1 | . | 5 | 1 | 1 | 1 | . | 6 | 1 | . | 153 | 29 |
| 30 | . | 1 | . | . | . | . | 2 | . | 2 | . | . | 5 | . | . | 2 | 2 | . | . | . | . | 2 | . | . | . | 1 | . | 2 | . | 67 | 30 |
| 31 | 1 | 5 | 6 | 1 | . | . | 1 | . | 11 | 2 | 1 | 6 | . | 5 | 1 | . | . | . | 1 | 1 | . | . | 2 | 10 | 1 | 8 | . | . | 183 | 31 |
| 32 | 2 | 2 | 2 | 2 | 1 | . | 3 | 1 | 11 | . | 1 | 20 | 2 | 4 | 6 | 1 | . | 1 | . | 7 | 2 | 1 | . | 3 | 16 | 1 | 4 | . | 2 | 186 | 32 |
| 33 | 1 | 3 | 4 | 1 | . | 1 | . | 3 | 3 | 4 | 2 | 7 | 2 | 3 | 1 | . | . | 1 | 1 | 8 | 1 | . | . | . | 7 | . | 6 | . | . | 136 | 33 |
| 34 | . | 5 | 6 | 9 | . | . | 1 | 1 | 5 | . | . | 2 | . | . | 1 | . | . | 3 | . | 6 | 2 | 1 | . | . | 5 | . | 2 | 1 | . | 88 | 34 |
| 35 | . | 5 | 2 | . | . | 1 | 1 | 1 | 4 | . | 1 | 6 | 3 | 9 | 2 | . | . | 3 | . | 1 | 1 | . | . | 2 | 1 | . | 1 | 3 | . | 119 | 35 |
| 36 | . | 1 | . | . | . | 1 | 2 | . | 47 | 2 | . | . | 1 | . | 1 | . | 2 | . | 1 | 2 | . | . | . | 1 | . | . | 1 | . | 2 | 75 | 36 |
| 37 | 1 | 2 | 2 | . | . | 3 | 15 | . | 78 | 3 | . | 4 | . | 2 | 5 | . | 2 | . | 1 | 3 | 2 | . | 1 | 1 | . | . | 3 | . | . | 215 | 37 |
| 38 | . | 1 | . | . | . | 2 | 6 | 1 | 34 | 1 | . | . | . | . | . | . | . | . | . | 1 | 1 | 2 | . | 1 | . | . | 1 | . | . | 92 | 38 |
| 39 | . | . | . | . | . | 2 | 19 | 2 | 68 | 1 | . | 8 | . | . | 4 | . | . | . | . | 1 | 1 | . | . | 1 | . | . | 1 | . | 2 | 159 | 39 |
| 40 | . | . | . | . | . | . | 17 | . | 74 | 1 | 1 | 3 | . | . | 2 | . | . | . | 2 | . | . | . | . | . | . | 2 | . | 1 | 142 | 40 |
| 41 | . | 4 | 1 | 2 | 1 | 5 | 25 | 1 | 97 | 1 | . | 5 | . | 1 | 6 | . | . | . | . | 5 | . | . | 2 | . | 1 | 2 | . | . | 246 | 41 |
| 42 | . | . | . | . | . | 1 | 3 | 1 | 18 | 2 | 1 | . | . | 2 | . | . | . | . | . | . | . | . | 1 | 2 | . | . | . | . | 51 | 42 |
| 43 | . | . | . | . | . | 1 | 2 | . | 73 | 2 | 1 | 6 | . | . | 6 | . | . | . | . | 3 | . | . | 1 | 2 | . | 1 | . | . | 139 | 43 |
| 44 | . | . | . | . | . | 2 | . | 3 | 29 | 2 | . | 2 | . | 2 | 1 | . | . | . | . | 2 | 1 | . | . | 1 | . | . | . | . | 74 | 44 |
| | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | | |

137
48

TABLE 11.—*Candidates Licensed*

| Marginal Number | SCHOOL | 1 Alabama | 2 Arizona | 3 Arkansas | 4 California | 5 Colorado | 6 Connecticut | 7 Delaware | 8 Dist. of Columbia | 9 Florida | 10 Georgia | 11 Idaho | 12 Illinois | 13 Indiana | 14 Iowa | 15 Kansas | 16 Kentucky | 17 Louisiana | 18 Maine | 19 Maryland | 20 Massachusetts | 21 Michigan | 22 Minnesota | Marginal Number |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **NORTH CAROLINA** | | | | | | | | | | | | | | | | | | | | | | | |
| 45 | Bowman Gray Sch. of Med. | 11 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 1 | . | 45 |
| 46 | Duke Univ. | 2 | 1 | . | 8 | . | 5 | . | 6 | 8 | . | . | 2 | 1 | . | . | 1 | . | 1 | 1 | 5 | 3 | 2 | 46 |
| | **OHIO** | | | | | | | | | | | | | | | | | | | | | | | |
| 47 | Ohio State Univ. | 1 | . | . | 20 | . | 1 | . | 2 | . | 1 | . | 4 | 3 | . | 1 | . | 2 | 1 | . | 1 | 5 | 1 | 47 |
| 48 | Univ. of Cincinnati | 3 | . | . | 16 | . | . | . | 3 | . | . | . | 6 | 5 | 1 | 1 | 0 | 1 | . | 1 | 2 | 7 | . | 48 |
| 49 | Western Reserve Univ. | . | 4 | . | 22 | 1 | . | . | 2 | . | 1 | . | 7 | 4 | 1 | . | . | 1 | . | 1 | 1 | 0 | 3 | 49 |
| | **OKLAHOMA** | | | | | | | | | | | | | | | | | | | | | | | |
| 50 | Univ. of Oklahoma | 2 | 2 | . | 12 | 2 | . | . | 2 | . | . | . | . | 2 | 1 | 3 | . | . | . | . | 2 | 4 | 4 | 50 |
| | **OREGON** | | | | | | | | | | | | | | | | | | | | | | | |
| 51 | Univ. of Oregon | . | . | . | 15 | 1 | . | . | . | . | 1 | . | . | . | 1 | . | . | . | . | . | . | 1 | . | 51 |
| | **PENNSYLVANIA** | | | | | | | | | | | | | | | | | | | | | | | |
| 52 | Hahnemann Med. Col. | 3 | 1 | . | 16 | 1 | 1 | 1 | 2 | . | . | . | 3 | 4 | 1 | . | . | 1 | . | 4 | 4 | 1 | . | 52 |
| 53 | Jefferson Med. Col. | 1 | 3 | . | 22 | 1 | 3 | . | 5 | . | 1 | . | 7 | 1 | . | 1 | 1 | 4 | 2 | 3 | 2 | 3 | 2 | 53 |
| 54 | Temple Univ. | 2 | 1 | . | 13 | 1 | 3 | . | 3 | . | 2 | . | 5 | 1 | . | 1 | . | 1 | . | 5 | 2 | 1 | 4 | 54 |
| 55 | Univ. of Pennsylvania | 2 | 1 | 1 | 36 | . | 4 | . | 4 | . | 1 | . | 3 | 1 | . | 1 | . | 2 | 2 | 4 | 10 | 5 | 7 | 55 |
| 56 | Univ. of Pittsburgh | . | 1 | . | 29 | . | 1 | . | 3 | . | . | . | . | . | 1 | . | 1 | 1 | . | 2 | 1 | . | . | 56 |
| 57 | Woman's Med. Col. of Pennsylvania | . | 1 | . | 2 | . | 1 | . | 1 | . | . | . | 1 | 1 | . | . | . | . | . | . | . | 2 | . | 57 |
| | **SOUTH CAROLINA** | | | | | | | | | | | | | | | | | | | | | | | |
| 58 | Med. Col. of South Carolina | . | . | . | 5 | . | 1 | . | 5 | . | 4 | . | . | . | . | 3 | 2 | . | . | 1 | 1 | . | 58 |
| | **TENNESSEE** | | | | | | | | | | | | | | | | | | | | | | | |
| 59 | Meharry Med. Col. | 6 | . | . | 19 | . | 1 | . | 3 | . | 1 | 4 | . | 6 | . | 2 | 2 | 1 | . | 4 | . | 5 | . | 59 |
| 60 | Univ. of Tennessee | 13 | . | 15 | 14 | . | . | . | 2 | . | 4 | . | 1 | . | 1 | 1 | 5 | 9 | . | . | 1 | 4 | . | 60 |
| 61 | Vanderbilt Univ. | 10 | . | 2 | 7 | 3 | 1 | . | 1 | . | 2 | . | 1 | 1 | 1 | 1 | 7 | 3 | . | 1 | 2 | 4 | 2 | 61 |
| | **TEXAS** | | | | | | | | | | | | | | | | | | | | | | | |
| 62 | Baylor Univ. | 2 | 1 | 2 | 1 | . | . | . | 1 | . | 1 | . | 1 | . | . | 1 | . | 4 | . | . | 1 | 2 | . | 62 |
| 63 | Southwestern Med. Col. | . | . | . | 4 | . | . | . | . | . | . | . | . | . | . | . | . | 1 | . | . | . | . | . | 63 |
| 64 | Univ. of Texas | . | . | . | 12 | 1 | . | . | . | . | 1 | . | 1 | 1 | . | . | . | 8 | . | . | 2 | . | . | 64 |
| | **UTAH** | | | | | | | | | | | | | | | | | | | | | | | |
| 65 | Univ. of Utah | . | 1 | . | 2 | 1 | 9 | . | 1 | . | . | . | 1 | . | . | . | 1 | . | 1 | 3 | 6 | 1 | . | 65 |
| | **VERMONT** | | | | | | | | | | | | | | | | | | | | | | | |
| 66 | Univ. of Vermont | . | 1 | . | 2 | 1 | 9 | . | 1 | . | . | . | 1 | . | . | . | 1 | . | 1 | 3 | 6 | 1 | . | 66 |
| | **VIRGINIA** | | | | | | | | | | | | | | | | | | | | | | | |
| 67 | Med. Col. of Virginia | 1 | 3 | . | 8 | . | . | . | 3 | . | . | . | 1 | 1 | . | . | 3 | 1 | . | 2 | 2 | 3 | 5 | 67 |
| 68 | Univ. of Virginia | 3 | 1 | 1 | 9 | 1 | . | . | 7 | . | 4 | . | 1 | 1 | . | . | . | 3 | . | 3 | 3 | 1 | . | 68 |
| | **WISCONSIN** | | | | | | | | | | | | | | | | | | | | | | | |
| 69 | Marquette Univ. | . | 2 | . | 28 | 1 | . | . | 1 | . | 1 | 5 | 6 | 1 | . | . | . | . | | | 1 | 8 | 4 | 69 |
| 70 | Univ. of Wisconsin | . | 2 | . | 16 | 1 | . | . | 2 | . | . | 5 | 4 | 2 | 1 | . | 1 | . | . | . | . | 2 | 2 | 70 |
| | **CANADA** | | | | | | | | | | | | | | | | | | | | | | | |
| 71 | Dalhousie Univ. | . | . | . | 3 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 1 | . | . | 71 |
| 72 | Laval Univ. | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 72 |
| 73 | Mc Gill Univ. | . | 1 | . | 17 | . | 6 | . | . | . | . | . | 2 | . | . | 1 | . | 1 | 2 | 3 | 6 | 1 | 3 | 73 |
| 74 | Queen's Univ. | . | . | . | . | . | 1 | . | . | . | . | . | . | 1 | . | . | . | 1 | . | . | . | . | . | 74 |
| 75 | Univ. of Alberta | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 1 | . | . | . | 75 |
| 76 | Univ. of Manitoba | . | 2 | . | 1 | . | . | . | . | . | . | . | . | . | 1 | . | . | . | . | . | 1 | . | . | 76 |
| 77 | Univ. of Montreal | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 77 |
| 78 | Univ. of Toronto | . | . | . | 10 | . | . | . | 1 | . | . | . | 2 | . | . | . | . | . | . | . | 2 | 1 | . | 78 |
| 79 | Univ. of Western Ontario | . | . | . | 4 | . | . | . | 1 | . | . | . | . | . | . | . | . | . | . | 2 | . | 1 | . | 79 |
| | **OTHERS** | | | | | | | | | | | | | | | | | | | | | | | |
| 80 | Foreign Med. Faculties | 1 | 2 | 1 | 7 | . | 10 | . | 5 | . | . | . | 1 | 4 | . | . | . | . | . | 2 | 1 | 1 | . | 80 |
| 81 | Extinct Med. Sch. | 2 | 6 | . | 57 | 1 | . | 1 | 6 | . | 2 | . | 5 | 7 | 4 | . | 3 | 2 | . | 4 | 2 | 7 | 1 | 81 |
| 82 | Unapproved Med. Schools | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 82 |
| 83 | Schools of Osteopathy | . | . | . | . | . | . | . | 1 | . | . | . | . | . | . | . | . | . | . | . | 1 | . | . | 83 |
| | **Total** | 113 | 84 | 38 | 1328 | 88 | 200 | 6 | 216 | 0 | 69 | 9 | 271 | 153 | 112 | 64 | 65 | 100 | 42 | 144 | 370 | 227 | 118 | |
| | **Marginal Number** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | |

| Marginal Number | Mississippi | Missouri | Montana | Nebraska | Nevada | New Hampshire | New Jersey | New Mexico | New York | North Carolina | North Dakota | Ohio | Oklahoma | Oregon | Pennsylvania | Rhode Island | South Carolina | South Dakota | Tennessee | Texas | Utah | Vermont | Virginia | Washington | West Virginia | Wisconsin | Wyoming | Alaska, Hawaii and Puerto Rico | Totals | Marginal Number |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 45 | . | . | . | . | . | . | 2 | . | 1 | . | . | . | . | . | . | . | . | 1 | . | . | . | . | . | . | . | . | . | . | 6 | 45 |
| 46 | 1 | 1 | . | . | 1 | . | 4 | . | 10 | 39 | . | 2 | 2 | . | 3 | . | 5 | . | 4 | 2 | . | . | 5 | 1 | 2 | . | . | 1 | 129 | 46 |
| 47 | 1 | 2 | . | 1 | 1 | 1 | 2 | 3 | 1 | 3 | . | . | 1 | . | 1 | . | . | . | . | 6 | 1 | . | 1 | 1 | 3 | . | . | . | 70 | 47 |
| 48 | . | 3 | . | . | . | 1 | 1 | . | 4 | 4 | . | 4 | . | . | 4 | . | . | 1 | . | 3 | . | . | 1 | . | . | 3 | . | . | 85 | 48 |
| 49 | . | . | 1 | . | . | . | . | 1 | 3 | 2 | 1 | 1 | 2 | 1 | 1 | . | . | . | 1 | 3 | . | . | 1 | 1 | 1 | 1 | 1 | . | 78 | 49 |
| 50 | 2 | 1 | 1 | 1 | . | . | 1 | 3 | . | 2 | 1 | 1 | 2 | 2 | | . | . | . | 2 | 15 | . | . | . | 3 | . | 1 | 1 | . | 74 | 50 |
| 51 | . | 1 | 1 | . | . | . | . | . | 1 | . | . | . | . | 16 | | . | . | . | . | 1 | . | . | .15 | | 1 | . | . | 1 | 56 | 51 |
| 52 | . | . | . | . | . | . | 27 | 1 | 13 | 1 | . | 5 | 1 | . | 28 | . | . | . | . | . | . | . | . | . | 1 | 2 | . | . | 122 | 52 |
| 53 | . | . | . | . | . | 2 | 15 | 1 | 10 | 4 | . | 9 | 2 | 1 | 14 | . | . | 1 | . | 5 | . | . | 4 | 3 | 3 | 1 | . | 2 | 139 | 53 |
| 54 | . | 2 | . | . | 1 | 1 | 9 | . | 6 | 4 | 2 | 3 | . | . | 10 | . | 1 | 1 | 1 | 2 | . | . | 2 | 4 | 1 | 1 | . | 2 | 98 | 54 |
| 55 | 1 | . | 1 | . | 1 | 1 | 12 | 2 | 14 | 5 | . | 10 | . | 2 | 19 | . | 1 | 1 | 1 | 2 | . | 4 | 4 | 4 | 5 | . | . | 2 | 176 | 55 |
| 56 | 1 | . | . | . | . | . | 3 | 1 | 6 | 1 | . | 8 | . | . | 2 | . | 1 | . | 1 | 5 | . | . | 1 | . | 1 | . | . | . | 72 | 56 |
| 57 | 3 | . | . | . | . | 1 | 1 | . | 5 | 1 | . | 2 | . | . | 2 | . | 1 | . | . | . | . | 1 | 1 | . | . | . | . | . | | 57 |
| 58 | . | . | . | . | . | . | . | . | . | 8 | 1 | 2 | . | 1 | 2 | . | . | . | 3 | 1 | . | . | 3 | . | 1 | 1 | . | . | 25 | 58 |
| 59 | 1 | 5 | . | . | . | . | 5 | . | 11 | 5 | . | 8 | . | . | 3 | . | 1 | . | 1 | 5 | . | . | 1 | . | 1 | . | . | 1 | 45 | 59 |
| 60 | 9 | 6 | . | . | . | . | . | 1 | . | 4 | . | 3 | 2 | . | . | 1 | . | 1 | 3 | 16 | . | . | 9 | 2 | 1 | . | . | 1 | 120 | 60 |
| 61 | 5 | 2 | . | . | . | . | . | . | 2 | 7 | . | 5 | . | 1 | 2 | . | 3 | . | 1 | 16 | . | . | 3 | 1 | . | . | . | . | 97 | 61 |
| 62 | 1 | . | . | . | . | . | 1 | 2 | 4 | 3 | . | . | . | . | 1 | . | . | . | 1 | 3 | . | . | . | . | . | . | . | 1 | 34 | 62 |
| 63 | . | . | . | . | . | . | . | . | 1 | . | . | . | 1 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 7 | 63 |
| 64 | 1 | 3 | 2 | . | . | . | 1 | 2 | 7 | . | . | 2 | 1 | 1 | 2 | . | . | . | 1 | . | . | . | 1 | 1 | . | 2 | . | 2 | 56 | 64 |
| 65 | . | . | . | 1 | . | 4 | . | . | 12 | . | . | 1 | . | . | 2 | 1 | . | 1 | . | 2 | 1 | 10 | . | 1 | . | 1 | . | . | 5 | 65 |
| 66 | . | . | . | 1 | . | 4 | . | . | 12 | . | . | 1 | . | . | 2 | 1 | . | 1 | . | 2 | 1 | 10 | . | 1 | . | 1 | . | . | 71 | 66 |
| 67 | . | . | . | 1 | . | . | 1 | . | 15 | 19 | . | 4 | 1 | 1 | 1 | . | 2 | . | 3 | 2 | . | . | 1 | 4 | 88 | 1 | 1 | . | 98 | 67 |
| 68 | 1 | . | . | . | 1 | 1 | 3 | 1 | 7 | 9 | . | 3 | . | . | 2 | . | 2 | . | . | 7 | . | 1 | 2 | 2 | 7 | . | . | . | 86 | 68 |
| 69 | 2 | 2 | 1 | 1 | 1 | 1 | 2 | 1 | 6 | . | . | 5 | . | 4 | 2 | . | . | 1 | . | 2 | . | . | . | 5 | 114 | 1 | 1 | | 111 | 69 |
| 70 | . | 2 | . | . | 1 | . | 1 | 1 | 5 | . | . | 1 | . | . | 2 | . | . | 1 | . | 3 | . | . | 1 | 1 | 1 | 13 | 1 | 1 | 73 | 70 |
| 71 | . | . | . | . | . | 2 | 2 | . | 1 | . | . | . | . | . | . | . | . | . | . | . | . | 1 | . | . | . | 1 | . | . | 7 | 71 |
| 72 | . | . | . | . | . | 2 | 1 | . | 1 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 5 | 72 |
| 73 | 1 | . | . | . | . | . | 2 | . | 5 | 4 | . | 3 | . | . | . | . | 2 | . | 1 | 4 | . | 1 | 2 | 3 | . | . | . | . | 71 | 73 |
| 74 | . | . | . | . | . | . | . | . | 2 | . | . | 1 | . | . | . | . | . | . | . | . | . | . | 1 | . | . | . | . | 1 | 7 | 74 |
| 75 | 1 | . | . | . | . | . | . | . | 1 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 3 | 75 |
| 76 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 1 | . | 1 | . | 1 | . | . | . | . | 8 | 76 |
| 77 | . | . | . | . | . | . | . | . | 2 | . | . | . | . | . | . | . | . | . | . | . | . | 2 | . | . | . | . | . | . | 2 | 77 |
| 78 | . | 1 | . | . | . | . | . | . | 2 | 1 | . | 3 | . | . | . | . | 1 | . | . | . | . | . | . | . | . | . | . | . | 24 | 78 |
| 79 | . | . | . | . | . | 1 | . | . | . | 1 | . | . | 1 | 1 | . | . | . | . | . | . | . | . | . | . | . | 1 | . | . | 13 | 79 |
| 80 | . | . | . | 1 | . | 6 | 24 | . | 18 | . | . | 26 | . | . | . | 1 | . | . | . | 13 | . | 1 | 4 | 3 | . | . | . | 3 | 135 | 80 |
| 81 | . | 7 | 2 | 2 | . | 2 | 6 | 4 | 4 | 2 | 1 | 7 | 2 | 2 | 4 | . | . | 1 | . | 20 | . | . | . | 3 | . | 5 | . | 1 | 105 | 81 |
| 82 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 0 | 82 |
| 83 | . | . | . | . | . | 3 | 2 | . | . | 75 | . | 10 | . | . | 16 | . | . | . | . | . | . | . | . | . | . | 3 | . | . | 111 | 83 |
| | 60 | 150 | 52 | 38 | 11 | 77 | 289 | 65 | 1,035 | 223 | 28 | 307 | 50 | 119 | 210 | 19 | 40 | 35 | 55 | 336 | 23 | 40 | 136 | 185 | 59 | 154 | 20 | 49 | 7,682 | |

| 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

### LICENTIATES REPRESENTING ADDITIONS TO THE MEDICAL PROFESSION

The number of physicians who received their first license to practice medicine and surgery in 1947 and thus represent additions to the medical profession in the United States and its territories are presented in tables 12 and 13. Included in these compilations are candidates examined in 1947 and licensed, some who were examined in previous years whose licenses were withheld for lack of internship, citizenship or other technicalities and issued in 1947, and physicians not licensed in any state who were endorsed and licensed during the year on the basis of the examination of the National Board of Medical Examiners. The data also include physicians licensed on the basis of military credentials, Canadian and foreign licenses. The majority represent recent graduates.

These official figures indicate that last year 6,855 individuals were added to the

TABLE 12.—*Licentiates Representing Additions to the Medical Profession, 1947*

| | Examination | Reciprocity and Endorsement | Total |
|---|---|---|---|
| Alabama | 41 | 1 | 42 |
| Arizona | 5 | 4 | 9 |
| Arkansas | 49 | 1 | 50 |
| California | 423 | 106 | 529 |
| Colorado | 84 | 4 | 88 |
| Connecticut | 38 | 71 | 109 |
| Delaware | 10 | 0 | 10 |
| District of Columbia | 35 | 53 | 88 |
| Florida | 35 | 0 | 35 |
| Georgia | 122 | 9 | 131 |
| Idaho | 14 | 5 | 19 |
| Illinois | 556 | 41 | 597 |
| Indiana | 107 | 3 | 110 |
| Iowa | 93 | 22 | 115 |
| Kansas | 80 | 6 | 86 |
| Kentucky | 89 | 2 | 91 |
| Louisiana | 195 | 0 | 195 |
| Maine | 19 | 19 | 38 |
| Maryland | 145 | 12 | 157 |
| Massachusetts | 52 | 225 | 277 |
| Michigan | 148 | 22 | 170 |
| Minnesota | 175 | 16 | 191 |
| Mississippi | 55 | 1 | 56 |
| Missouri | 258 | 12 | 270 |
| Montana | 5 | 0 | 5 |
| Nebraska | 86 | 3 | 89 |
| Nevada | 1 | 0 | 1 |
| New Hampshire | 9 | 14 | 23 |
| New Jersey | 77 | 58 | 135 |
| New Mexico | 1 | 3 | 4 |
| New York | 447 | 616 | 1,063 |
| North Carolina | 112 | 44 | 156 |
| North Dakota | 17 | 1 | 18 |
| Ohio | 269 | 33 | 302 |
| Oklahoma | 71 | 5 | 76 |
| Oregon | 78 | 9 | 87 |
| Pennsylvania | 404 | 63 | 467 |
| Rhode Island | 27 | 14 | 41 |
| South Carolina | 53 | 3 | 56 |
| South Dakota | 10 | 3 | 13 |
| Tennessee | 111 | 3 | 114 |
| Texas | 262 | 9 | 271 |
| Utah | 41 | 0 | 41 |
| Vermont | 12 | 16 | 28 |
| Virginia | 124 | 12 | 136 |
| Washington | 45 | 12 | 57 |
| West Virginia | 18 | 4 | 22 |
| Wisconsin | 130 | 20 | 150 |
| Wyoming | 0 | 2 | 2 |
| Alaska, Hawaii, Puerto Rico & Virgin Islands | 19 | 16 | 35 |
| | 5,257 | 1,598 | 6,855 |

TABLE 13.—*Licentiates Representing Additions to the Medical Profession Grouped in Geographic Divisions, 1947*

| | Examination | Reciprocity and Endorsement | Total |
|---|---|---|---|
| New England | | | |
| Maine | 19 | 19 | 38 |
| New Hampshire | 9 | 14 | 23 |
| Vermont | 12 | 16 | 28 |
| Massachusetts | 52 | 225 | 277 |
| Rhode Island | 27 | 14 | 41 |
| Connecticut | 38 | 71 | 109 |
| Totals | 157 | 359 | 515 |
| Middle Atlantic | | | |
| New York | 447 | 616 | 1,063 |
| New Jersey | 77 | 58 | 135 |
| Pennsylvania | 404 | 63 | 467 |
| Totals | 928 | 737 | 1,665 |
| East North Central | | | |
| Ohio | 269 | 33 | 302 |
| Indiana | 107 | 3 | 110 |
| Illinois | 555 | 41 | 597 |
| Michigan | 148 | 22 | 170 |
| Wisconsin | 130 | 20 | 150 |
| Totals | 1,210 | 119 | 1,329 |
| West North Central | | | |
| Minnesota | 175 | 16 | 191 |
| Iowa | 93 | 22 | 115 |
| Missouri | 258 | 12 | 270 |
| North Dakota | 17 | 1 | 18 |
| South Dakota | 10 | 3 | 13 |
| Nebraska | 86 | 3 | 89 |
| Kansas | 80 | 6 | 86 |
| Totals | 719 | 63 | 782 |
| South Atlantic | | | |
| Delaware | 10 | 0 | 10 |
| Maryland | 145 | 12 | 157 |
| District of Columbia | 35 | 53 | 88 |
| Virginia | 124 | 12 | 136 |
| West Virginia | 18 | 4 | 22 |
| North Carolina | 112 | 44 | 156 |
| South Carolina | 53 | 3 | 56 |
| Georgia | 122 | 9 | 131 |
| Florida | 35 | 0 | 35 |
| Totals | 654 | 137 | 791 |
| East South Central | | | |
| Kentucky | 89 | 2 | 91 |
| Tennessee | 111 | 3 | 114 |
| Alabama | 41 | 1 | 42 |
| Mississippi | 55 | 1 | 56 |
| Totals | 296 | 7 | 303 |
| West South Central | | | |
| Arkansas | 49 | 1 | 50 |
| Louisiana | 195 | 0 | 195 |
| Oklahoma | 71 | 5 | 76 |
| Texas | 262 | 9 | 271 |
| Totals | 577 | 15 | 592 |
| Mountain | | | |
| Montana | 5 | 0 | 5 |
| Idaho | 14 | 5 | 19 |
| Wyoming | 0 | 2 | 2 |
| Colorado | 84 | 4 | 88 |
| New Mexico | 1 | 3 | 4 |
| Arizona | 5 | 4 | 9 |
| Utah | 41 | 0 | 41 |
| Nevada | 1 | 0 | 1 |
| Totals | 151 | 18 | 169 |
| Pacific | | | |
| Washington | 45 | 12 | 57 |
| Oregon | 78 | 9 | 87 |
| California | 423 | 106 | 529 |
| Totals | 546 | 127 | 673 |
| Territory and Possessions | | | |
| Alaska, Hawaii, Puerto Rico & Virgin Islands | 19 | 16 | 35 |
| Totals | 5,257 | 1,598 | 6,855 |

physician population in this country, Alaska, Hawaii, Puerto Rico and the Virgin Islands. The number removed by death in the United States, its possessions and those who were temporarily located in foreign countries in the same period was 3,575. It would appear that the physician population was increased by 3,280 new licentiates in 1947. There was a decrease of 110 in new licentiates as compared with 1946. The 1946 figure included many medical officers returning to private practice who had entered one of the services before obtaining state licensure. By reference to table 1 it can be noted that 14,429 licenses were issued in 1947, indicating that 7,574 had previously been registered.

The greatest number of physicians in any one state, 1,063, was added to the profession in New York. Both California and Illinois added more than 500 and Pennsylvania more than 400. Comparison with 1946 figures[1] shows increases in eighteen states. Of the smaller states in terms of population, increases were noted in Idaho, Kentucky, Mississippi, Nebraska, North Dakota, Oregon, Rhode Island, South Dakota and Utah, which reflects an improvement in the distribution of physicians and of medical care in these states.

The 6,855 licentiates constituting additions to the medical profession last year represented 5,257 who secured their first licenses by the usual method of written examination and 1,598 by endorsement of credentials. The latter were mainly diplomates of the National Board of Medical Examiners.

The companion table in this section rearranges the figures in nine geographic divisions. The Middle Atlantic and East North Central group of states added the greatest number, 1,665 and 1,329, respectively. More than 500 were added in five groups—South Atlantic

TABLE 14.—*Licentiates Representing Additions to the Medical Profession, 1935-1947*

| | Examination | Reciprocity and Endorsement | Total |
|---|---|---|---|
| 1935 | 5,099 | 411 | 5,510 |
| 1936 | 5,548 | 629 | 6,177 |
| 1937 | 5,812 | 612 | 6,424 |
| 1938 | 5,759 | 501 | 6,260 |
| 1939 | 5,584 | 460 | 6,044 |
| 1940 | 5,432 | 455 | 5,887 |
| 1941 | 5,241 | 473 | 5,714 |
| 1942 | 5,558 | 454 | 6,012 |
| 1943 | 5,585 | 372 | 5,957 |
| 1944 | 6,494 | 470 | 6,964 |
| 1945 | 4,945 | 769 | 5,714 |
| 1946 | 5,357 | 1,608 | 6,965 |
| 1947 | 5,257 | 1,598 | 6,855 |
| Totals | 71,671 | 8,812 | 80,483 |

791, West North Central 782, Pacific 673, West South Central 592 and New England 516. The East South Central group added 303, while the fewest physicians, 169, were added in the Mountain states.

1. J. A. M. A. 134:271 (May 17) 1947.

In thirteen years there were 80,483 physicians added to the medical profession (table 14); 71,671 were licensed after written examination and 8,812 by endorsement of credentials. In the same period 130,052 licenses were issued, 82,049 by examination and 48,003 by endorsement of credentials. Calculations indicate that 49,569 licenses were issued to physicians who had previously been licensed to practice medicine.

Estimated figures indicate that on April 1, 1948 the number of physicians in continental United States was 199,764.

### LICENSURE UNDER THE ACCELERATED PROGRAM

During the academic year 1946-1947 eighteen schools continued to have an accelerated program either in part or in whole. Physicians who have or will obtain their professional training under this program will experience no difficulty in obtaining licensure. All states, as well as the District of Columbia, Alaska, Hawaii and Puerto Rico, have indicated that they will adjust their regulations to facilitate the licensure of these physicians. Legislation in four instances (District of Columbia, Georgia, Illinois and Minnesota) might present difficulties for those students who completed all their work under the accelerated program and spend a week or two less than thirty-six months in a medical school.

### PREMEDICAL TRAINING REQUIREMENT OF LICENSING BOARDS

The minimum requirements of the Council on Medical Education and Hospitals for admission to approved medical schools since 1918 has been two years of college training, and in 1938 three years was recommended. With the exception of California (table 15) the state licensing boards, by statute in the majority of instances, require that an applicant for licensure must present evidence of having completed two years of college. In November, 1942 the Council on Medical Education and Hospitals recommended that, for the duration of the war, premedical education including satisfactory courses in physics, biology and inorganic and organic chemistry, be included within two calendar years. Such a program was adopted by practically all medical schools in the United States and Canada. There is a distinct trend toward the establishment of the prewar requirements. There are now sixty-seven of the eighty-seven schools requiring three or more years of premedical work.

An important problem regarding premedical requirements is posed by the many excellent educational opportunities at the high school and college level afforded men in the armed forces. The American Council on Education recommends the awarding of certain high school and college credits for courses taken by members of the armed forces (a) by correspondence through the Armed Forces Institute, which operates in collaboration with colleges and universities, and (b) in classroom work in various schools operated for men and women in the armed services.

The American Council on Education, representing higher education in this country, has carefully evaluated the content and quality of the many courses given in both these categories. It has issued the "Guide to the Evaluation of Educational Experiences in the Armed Forces" to assist colleges desiring to do so to award high school and college credit for specific courses taken in this program.

In addition to awarding credit for courses actually taken, as already described, there is a program for evaluating a veteran's learning experiences while in the armed forces by administering "general educational development tests" and awarding appropriate credit at the high school and college levels on the basis of the examination results, even though formal course work in the subject matter of the examination was not taken by the candidate. These are comprehensive examinations developed by the Armed Forces Institute and sponsored by the American Council on Education.

The Council on Medical Education and Hospitals has agreed to these recommendations in principle in the following statement:

TABLE 15.—*Requirements of Premedical Training by Medical Licensing Boards*

| Two Years or More of College | | |
|---|---|---|
| Alabama | Louisiana | Oklahoma |
| Alaska | Maine | Oregon |
| Arizona | Maryland | Pennsylvania |
| Arkansas | Massachusetts | Puerto Rico |
| Canal Zone | Michigan | Rhode Island |
| Colorado | Minnesota | South Carolina |
| Connecticut | Mississippi | South Dakota |
| Delaware | Missouri | Tennessee |
| District of Columbia | Montana | Texas |
| Florida | Nebraska | Utah |
| Georgia | Nevada | Vermont |
| Hawaii | New Hampshire | Virgin Islands |
| Idaho | New Jersey | Virginia |
| Illinois | New Mexico | Washington |
| Indiana | New York | West Virginia |
| Iowa | North Carolina | Wisconsin |
| Kansas | North Dakota | Wyoming |
| Kentucky | Ohio | |
| One Year of College | | |
| California | | |

*High School and College Credit for Veterans*

A. Courses at the high school and college level have been offered to members of the armed forces,

1. by correspondence through the "Armed Forces Institute," which operates in collaboration with colleges and universities, and

2. in classroom work in various schools operated for men and women in the armed services.

The American Council on Education, representing higher education in this country, has carefully evaluated the content and quality of the many courses given in both these categories. It has issued the "Guide to the Evaluation of Educational Experiences in the Armed Forces" to assist colleges desiring to do so to award proper high school and college credit for specific courses taken in this program.

B. In addition to awarding credit for courses actually taken, as described in A, there is a program for evaluating a veteran's knowledge in a given field by administering "General Educational Development Tests" and awarding appropriate credit at the high school and college levels on the basis of the examination results, even though formal course work in the subject matter of the examination was not taken by the candidate. These are comprehensive examinations developed by the Armed Forces Institute and sponsored by the American Council on Education.

C. The Council on Medical Education and Hospitals of the American Medical Association (*a*) has confidence in the American Council on Education and its "Guide to the Evaluation of Educational Experiences in the Armed Forces," in the Armed Forces Institute and in the General Educational Development tests and (*b*) wishes to support sound procedures permitting veterans to commence their education in civilian institutions at a level commensurate with their ability and knowledge. Therefore the Council has decided that approved medical schools desiring to accept students at the freshman level partially on the basis of high school or college awarded credit as described in A and B will not be in conflict with the Council's regulations and policies, except that college credit for science courses requiring laboratory work should not be allowed on this basis, nor should blanket credit be allowed for military service not based on courses or examinations. Specifically, a medical college may accept, in partial fulfilment of premedical requirements:

1. High school credits, based on

(*a*) Courses taken from the Armed Forces Institute or in service courses of the armed forces according to the "Guide to the Evaluation of Educational Experiences in the Armed Forces."

(*b*) Performance in the General Educational Development Tests; such credit may include the equivalent of a complete high school course.

2. College credits (except in science courses requiring laboratory work, or except blanket credits for military services not based on courses or examinations), based on

(*a*) Courses taken from the Armed Forces Institute or in service courses of the armed forces according to the "Guide to the Evaluation of Educational Experiences in the Armed Forces."

(*b*) Performance in the General Education Development Tests.

The licensing boards of all but four states have indicated that the awarding of premedical credits under this plan by approved medical schools as the equivalent of the required premedical training will satisfy the requirement for licensure.

The Army Specialized Training and Navy V-12 premedical programs called for less than two years of college training, but in both these programs the studies were continuous and provided for the student carrying more than the normal peacetime studies per semester. Both the Army and Navy programs provided for work well in excess of the sixty semester hours constituting the normal two academic years of medical study. The information received from these states whose licensure laws include specific premedical requirements seems to indicate that there should be no licensure difficulties encountered by students whose premedical work was taken under the Army Specialized Training or Navy V-12 or comparably accelerated civilian programs.

TABLE 16.—*Professional Educational Requirements by Medical Licensing Boards*

| | Length of Medical School Academic Year | | | | | | Total Time Spent in Medical School (Registration to Graduation) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Hours | Weeks | Months | Same as Approved Medical Schools | Same as A.A.M.C. & C.M.E. & H. | Not Specified by Board | Hours | Weeks | Months | Years | M.D. Degree | Same as Approved Medical Schools | Same as Approved A.A.M.C. & C.M.E. & H.* |
| Alabama | .. | .. | 9 | .. | .. | .. | .. | .. | .. | .. | X | .. | .. |
| Arizona | .. | .. | .. | .. | X | .. | .. | .. | .. | .. | .. | .. | X |
| Arkansas | .. | .. | .. | .. | .. | X | .. | .. | .. | 4 | .. | .. | .. |
| California | .. | 32 | .. | .. | .. | .. | 4,000 | .. | .. | .. | .. | .. | .. |
| Colorado | .. | .. | .. | .. | .. | X | .. | .. | .. | .. | X | .. | .. |
| Connecticut | .. | 32 | .. | .. | .. | .. | .. | 128 | .. | .. | .. | .. | .. |
| Delaware | .. | .. | .. | .. | .. | X | .. | .. | .. | .. | X | .. | .. |
| District of Columbia | .. | .. | 9 | .. | .. | .. | .. | .. | .. | 4 | .. | .. | .. |
| Florida | .. | .. | .. | .. | .. | X | .. | .. | .. | .. | X | .. | .. |
| Georgia | .. | .. | 9 | .. | .. | .. | .. | .. | .. | 4 | .. | .. | .. |
| Idaho | .. | .. | 9 | .. | .. | .. | .. | .. | .. | 4 | .. | .. | .. |
| Illinois | .. | .. | 9 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Indiana | .. | .. | .. | .. | .. | X | .. | .. | 40 | .. | .. | .. | .. |
| Iowa | .. | .. | 9 | .. | .. | .. | .. | .. | 42 | .. | .. | .. | .. |
| Kansas | .. | .. | .. | .. | .. | X | .. | .. | .. | 4 | .. | .. | .. |
| Kentucky | .. | .. | 9 | .. | .. | .. | .. | .. | .. | 4 | .. | .. | .. |
| Louisiana | .. | .. | .. | .. | X | .. | .. | .. | .. | 4 | X | .. | X |
| Maine | .. | 36 | 9 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| Maryland | .. | .. | .. | X | .. | .. | .. | .. | .. | 4 | .. | X | .. |
| Massachusetts | .. | 32 | .. | .. | .. | .. | .. | 128 | .. | .. | .. | .. | .. |
| Michigan | .. | 32 | .. | .. | .. | .. | .. | .. | 36 | .. | .. | .. | .. |
| Minnesota | .. | 36 | .. | .. | .. | .. | .. | .. | .. | 4 | .. | .. | .. |
| Mississippi | .. | 32 | .. | .. | .. | .. | .. | .. | .. | 4 | .. | .. | .. |
| Missouri | .. | 32 | .. | .. | .. | .. | .. | .. | .. | 4 | .. | .. | .. |
| Montana | .. | .. | .. | X | .. | .. | .. | .. | .. | .. | X | X | .. |
| Nebraska | .. | .. | 8½ | .. | .. | .. | .. | .. | 34 | .. | .. | .. | .. |
| Nevada | 900-1100 | .. | 9 | .. | .. | .. | .. | .. | .. | 4 | .. | .. | .. |
| New Hampshire | .. | .. | .. | .. | .. | X | .. | .. | .. | 4 | .. | .. | .. |
| New Jersey | .. | .. | 8 | .. | .. | .. | .. | .. | .. | 4 | .. | .. | .. |
| New Mexico | .. | .. | .. | X | .. | .. | .. | .. | .. | .. | X | X | .. |
| New York | .. | .. | 8 | .. | .. | .. | .. | .. | .. | 4 | .. | .. | .. |
| North Carolina | .. | .. | 9 | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| North Dakota | .. | .. | .. | .. | .. | X | .. | .. | .. | .. | .. | .. | X |
| Ohio | .. | .. | 9 | .. | .. | .. | .. | .. | .. | 4 | .. | .. | .. |
| Oklahoma | .. | .. | 9 | .. | .. | .. | .. | .. | .. | 4 | .. | .. | .. |
| Oregon | .. | .. | 8 | .. | .. | .. | .. | .. | .. | 4 | .. | .. | .. |
| Pennsylvania | 1,120 | 32 | .. | .. | .. | .. | .. | .. | .. | 4 | .. | .. | .. |
| Rhode Island | .. | .. | .. | .. | .. | X | .. | .. | .. | .. | X | .. | .. |
| South Carolina | .. | .. | .. | X | .. | .. | .. | .. | .. | .. | X | X | .. |
| South Dakota | .. | .. | 8 | .. | .. | .. | .. | .. | .. | 4 | .. | .. | .. |
| Tennessee | .. | 36 | .. | .. | .. | .. | .. | .. | .. | 4 | .. | .. | .. |
| Texas | .. | .. | 8 | .. | .. | .. | .. | .. | .. | 4 | .. | .. | .. |
| Utah | .. | .. | 9 | .. | .. | .. | .. | .. | .. | 4 | .. | .. | .. |
| Vermont | 900 | .. | .. | .. | .. | .. | .. | .. | .. | 4 | .. | .. | .. |
| Virginia | .. | 32 | 8 | .. | .. | .. | .. | .. | .. | 4 | .. | .. | .. |
| Washington | .. | .. | 9 | .. | .. | .. | .. | .. | .. | 4 | .. | .. | .. |
| West Virginia | .. | .. | .. | .. | .. | X | .. | .. | .. | .. | X | X | .. |
| Wisconsin | .. | .. | .. | .. | .. | X | .. | .. | .. | 4 | .. | .. | .. |
| Wyoming | .. | .. | 9 | .. | .. | .. | .. | .. | .. | 4 | .. | .. | .. |
| Alaska | .. | .. | .. | .. | X | .. | .. | .. | .. | .. | .. | X | .. |
| Canal Zone | .. | .. | .. | X | .. | .. | .. | .. | .. | .. | X | X | .. |
| Hawaii | .. | .. | .. | .. | X | .. | .. | .. | .. | .. | .. | .. | .. |
| Puerto Rico | .. | .. | .. | .. | X | .. | .. | .. | .. | .. | .. | .. | X |
| Virgin Islands | .. | 36 | .. | .. | .. | .. | .. | .. | .. | X | .. | .. | .. |

* Association of American Medical Colleges and Council on Medical Education and Hospitals of the American Medical Association.

## PROFESSIONAL EDUCATIONAL REQUIREMENTS BY LICENSING BOARDS

The regulations of several of the state medical boards state in terms of hours, weeks or months the length of the medical school academic year. Similarly, some states specify in these terms the total time which must be spent in medical school. Table 16 outlines the requirements of each state in this respect. In presenting this table it should be remembered that in addition to these regulations an internship is required for licensure in some states. (See table 19.)

TABLE 17.—*Schedule of Written Examination Dates and Issuance of Licenses by Reciprocity or Endorsement of Credentials*

| | Written Examination | Licenses by Reciprocity or Endorsement Issued |
|---|---|---|
| Alabama | Once annually | Considered by Subcommittee on application |
| Arizona | Quarterly | Quarterly |
| Arkansas | June and November | Continuously |
| California | Feb., June, Aug., Oct. | Six meetings *annually to consider applications |
| Colorado | Jan. and July | Quarterly |
| Connecticut | Mar., July and Nov. | Continuously |
| Delaware | Jan. and July | Jan. and July |
| District of Columbia | Semi-annually | Quarterly |
| Florida | June and Nov. | None |
| Georgia | June and Oct. | June and Oct. |
| Idaho | Jan. and July | Jan. and July |
| Illinois | Quarterly | Quarterly |
| Indiana | Once annually | Every 6 weeks |
| Iowa | June and Dec. | Every 3 months |
| Kansas | Semi-annually | Semi-annually |
| Kentucky | Semi-annually | Continuously |
| Louisiana | June and Dec. | June and Dec. |
| Maine | Mar., July and Nov. | Mar., July and Nov. |
| Maryland | June and Dec. | Every 3 weeks |
| Massachusetts | Three times annually | Every month |
| Michigan | June and Oct. | Continuously |
| Minnesota | Quarterly | Quarterly |
| Mississippi | June | June and Dec. |
| Missouri | Semi-annually | Four to six times annually |
| Montana | Semi-annually | Semi-annually |
| Nebraska | Semi-annually | Continuously |
| Nevada | Semi-annually | Semi-annually |
| New Hampshire | Mar. and Dec. | Mar. and Dec. |
| New Jersey | June and Oct. | August |
| New Mexico | Semi-annually | Semi-annually |
| New York | Three times annually | Continuously |
| North Carolina | June | Five times annually |
| North Dakota | Jan and July | Jan. and July |
| Ohio | June and Dec. | Quarterly |
| Oklahoma | Once annually | Continuously |
| Oregon | Jan. and July | Quarterly |
| Pennsylvania | Jan. and July | Monthly |
| Rhode Island | Quarterly | Quarterly |
| South Carolina | June and Nov. | Monthly |
| South Dakota | Semi-annually | Semi-annually |
| Tennessee | Every 3 months | Continuously |
| Texas | June and Nov. | June and Nov. |
| Utah | Once annually | Quarterly |
| Vermont | Semi-annually | Continuously |
| Virginia | Semi-annually | Semi-annually |
| Washington | Semi-annually | Semi-annually |
| West Virginia | Quarterly | Quarterly |
| Wisconsin | Jan. and June | Jan. and June |
| Wyoming | Three times annually | Continuously |
| Alaska | Mar. and Sept. | Mar. and Sept. |
| Canal Zone | As needed | As needed |
| Hawaii | Jan. and July | Monthly |
| Puerto Rico | Semi-annually | Semi-annually |
| Virgin Islands | Continuously | Continuously |

## SCHEDULE OF WRITTEN EXAMINATION DATES AND RECIPROCITY MEETINGS

In table 17 is included the current schedules of state licensing boards for examinations for medical licensure and meetings held for the issuance of licenses by reciprocity or endorsement. Examination dates and reciprocity meetings have in recent years been scheduled by many states at more frequent intervals in order to assist physicians to commence the the practice of medicine. Executive officers and members of examining boards are to be commended for their cooperation, especially in view of the increase in volume of applications in 1946 and 1947. In other states temporary permits are granted enabling physicians to immediately begin the practice of medicine. (See table 22.)

## REQUIRED INTERNSHIPS

In tables 18 and 19 are listed the medical schools and licensing boards now requiring internships for the M.D. degree and licensure,

TABLE 18.—*Medical Schools Requiring an Internship*

| United States |
|---|
| College of Medical Evangelists |
| University of Southern California School of Medicine |
| Stanford University School of Medicine |
| Northwestern University Medical School |
| University of Minnesota Medical School |
| Duke University School of Medicine* |
| **Canada** |
| University of Alberta Faculty of Medicine |
| University of Manitoba Faculty of Medicine |
| Dalhousie University Faculty of Medicine |
| University of Montreal Faculty of Medicine |

*Degree not withheld until internship completed.

respectively. Six schools in the United States and four in Canada require an internship for graduation. Although relatively few schools require the internship for the M.D. degree, this is a requirement for licensure by twenty-three state medical licensing boards, the

TABLE 19.—*Medical Licensing Boards Requiring a One Year Internship*†

| | | |
|---|---|---|
| Alabama | Michigan* | Puerto Rico** |
| Alaska | Montana | Rhode Island* |
| Canal Zone* | Nevada | South Dakota |
| Connecticut (Homeo. Board) | New Hampshire | Utah* |
| Delaware* | New Jersey* | Vermont* |
| District of Columbia | New Mexico | Virgin Islands |
| Hawaii* | North Dakota* | Washington* |
| Idaho* | Oklahoma | West Virginia |
| Illinois* | Oregon | Wisconsin* |
| Iowa* | Pennsylvania* | Wyoming |

† Some states require the internship for graduates of medical faculties abroad and from reciprocity or endorsement applicants.

* Internship must be a rotating service.

** Two year rotating internship required.

Connecticut homeopathic medical examining board, the District of Columbia, Alaska, Canal Zone, Hawaii, Puerto Rico and the Virgin Islands. Sixteen boards require the internship to be a rotating service. The licensing boards have returned to the prewar requirement of a

one year internship but will continue to accept the nine month wartime internship. Several of the boards, however, require an additional three months of training in a military or civilian hospital. Table 20 lists these states and indicates the relationship of their requirement to the former nine month internship.

TABLE 20.—*Relationship of the Wartime Nine Month Internship to Licensure*

| Accepted as Fulfilling Internship Requirement | Additional Three Months in Civilian Hospital or Military Service Required | |
|---|---|---|
| | Will Give Examination at End of Nine Months | Will Not Give Examination Until Completion of Year's Service |
| Alaska | Alabama [1] | Illinois [2] |
| Canal Zone | Delaware | New Mexico |
| Connecticut (homeo. board) | Dist. of Columbia | Utah |
| Hawaii | Iowa [1] | Virgin Islands |
| Idaho | New Jersey | West Virginia [3] |
| Michigan [1] | North Dakota | |
| Montana | Oregon [1] | |
| Nevada | Rhode Island [1] | |
| New Hampshire | Vermont | |
| Oklahoma [1] | Washington [1] | |
| Pennsylvania | Wisconsin | |
| Puerto Rico | Wyoming | |
| South Dakota [3] | | |

1. Will also give examination on completion of the medical course but without hospital internship is completed.
2. Military medical service must be in a military hospital.
3. Three months service with United States Public Health Service acceptable.

A few of the medical schools and licensing boards maintain their own list of hospitals acceptable for intern training, but the list of approved internships compiled by the Council on Medical Education and Hospitals of the American Medical Association is generally used.

## LICENSURE REQUIREMENTS FOR INTERNS AND RESIDENTS

With few exceptions physicians serving internships are not required to hold a license in the state in which the hospital where they are interning is located. The legal requirements for applicants for residency training vary considerably. In some states there is no provision for the licensure of a resident. On the other hand, a number of states consider that residents are actually in the practice of medicine and require that such individuals possess a license to practice in the states. These facts are shown in table 21.

## LICENSURE ON GOVERNMENT CREDENTIALS

The medical practice acts of most states do not provide for the acceptance of government credentials as a basis for licensure without examinations. The boards of six states may issue a license without examination to a physician who has passed an examination for admission to the medical corps of the United States Army, Navy or Public Health Service. These states are California, Illinois, Texas, Utah, Virginia and Wisconsin. Legal residents of Pennsylvania who were qualified to take the state board examination but were prevented from doing so by reason of enlistment of induction into the military or naval forces of the United States in World War II are licensed without examination. In South Dakota former medical officers of World War II are exempted by law from the basic science board examination.

TABLE 21.—*Licensure Requirements for Interns and Residents*

| | Licensure in State Required for Interns | Licensure in State Required for Residents |
|---|---|---|
| Alabama | No | No |
| Arizona | No | No |
| Arkansas | No | No |
| California | No [a] | Yes [b] |
| Colorado | No | No |
| Connecticut | No | No [c] |
| Delaware | No [d] | No [d] |
| District of Columbia | No | Yes |
| Florida | No | Yes |
| Georgia | Yes | Yes |
| Idaho | No | No |
| Illinois | No | Yes |
| Indiana | No | Yes |
| Iowa | No | Yes |
| Kansas | No | Yes |
| Kentucky | No | No |
| Louisiana | Yes | Yes |
| Maine | No | Yes |
| Maryland | No [c] | Yes [c] |
| Massachusetts | Yes [d] | Yes [d] |
| Michigan | No | Yes |
| Minnesota | No | Yes |
| Mississippi | No | No |
| Missouri | No [c] | No [c] |
| Montana | No | No |
| Nebraska | No | No |
| Nevada | Yes | Yes |
| New Hampshire | No | No |
| New Jersey | No [e] | No [e] |
| New Mexico | No | Yes |
| New York | No | No |
| North Carolina | No | Yes |
| North Dakota | Yes | Yes |
| Ohio | No | Yes |
| Oklahoma | No | Yes |
| Oregon | No | No [c] |
| Pennsylvania | No | Yes [f] |
| Rhode Island | No | No |
| South Carolina | No | Yes |
| South Dakota | No | No |
| Tennessee | No [c] | Yes |
| Texas | No [c] | Yes |
| Utah | No | No |
| Vermont | No | No |
| Virginia | No [g] | No [g] |
| Washington | No | No |
| West Virginia | No | No |
| Wisconsin | No | Yes |
| Wyoming | No | No |
| Alaska | No | No |
| Canal Zone | No | No |
| Hawaii | No | No |
| Puerto Rico | Yes | Yes |
| Virgin Islands | No | No |

a. Physician registered with State Board may serve as intern not to exceed two years without licensure.
b. May commence residency before licensure.
c. Required by some hospitals
d. Registration with state board required.
e. May have service of two years without licensure.
f. Licensure required after one year's service.
g. May have service of three years without licensure.

## RELOCATION OF PHYSICIANS

The Council on Medical Service of the American Medical Association maintains a service by which it endeavors to be of assistance to physicians desiring to relocate. This is done through close association with state and county medical societies as a voluntary effort without any attempt to direct the location of a physician. Any physician can obtain a brief but comprehensive picture of the economic status of any particular area in which he is interested from the data contained on the county summary sheets. This includes data on

population, principal cities, physicians, hospitals and medical facilities and pertinent economic, social and financial information. A copy of this summary sheet is forwarded to the inquirer, and a copy of the letter to him is sent to the state and county medical society concerned.

In addition to the information contained on the summary sheets, other data are available for interested physicians. Requests for full time or part time salaried medical positions from industries, institutions and other organizations, requests from practicing physicians for associates, needs for specialists and requests of individuals for practices are cross filed and kept current by a return post card system, which keeps the Council on Medical Service informed of final locations, filling of vacancies and the securing of physicians.

TABLE 22.--*Temporary Permits, 1947*

| State | Permit Valid For: | Permits Granted |
|---|---|---|
| Arizona | 3 months | 62 |
| Florida | Next board meeting | 1 |
| Georgia[1] | Next board meeting | 125 |
| Indiana[1] | 6 months | 135 |
| Kansas | Next board meeting | 72 |
| Kentucky | 1-5 years (limited licensure) | -- |
| Louisiana | Next board meeting | -- |
| Mississippi | Next board meeting | 65 |
| Nebraska[1] | Until licensure is perfected | 7 |
| Nevada | Discontinued June 30, 1947 | 1 |
| New Hampshire | Varies | -- |
| New Jersey | Four months | -- |
| New Mexico | Next board meeting | 51 |
| North Carolina | Discretion of board | 1 |
| Utah | Next board meeting | -- |
| Virginia | Next board meeting | 18 |
| Washington | Discontinued June 30, 1947 | 46 |
| West Virginia | Next board meeting | 22 |
| Puerto Rico | Until 1950[2] | 42 |
| Total | | 648 |

1. Reciprocity applicants
2. Government positions only

## TEMPORARY PERMITS

The licensing boards of eighteen states and Puerto Rico provide for the issuance of temporary permits. These states, the length of validity of the permit and the number of permits granted during the last calendar year are shown in table 22. Alaska and Maine discontinued this service in 1947, while provisions for temporary permits were established during the year in Kansas, Nebraska, Nevada, New Jersey, North Carolina and Utah. Indiana and Nebraska grant permits only to reciprocity applicants, and Puerto Rico to physicians in government positions.

## ANNUAL REGISTRATION

Thirty states, the District of Columbia, Alaska and Hawaii require physicians to register their license annually or biennially. In table 23 are listed the licensing boards which exact this requirement. Some of these boards require such registration whether or not physicians reside in the state. The fee ranges from $1 to $10. Six states have a resident and a nonresident fee. Montana and New York require biennial registration. Indiana, Tennessee and Virginia added this regulation in 1947, while it was dropped last year in Delaware.

## CANDIDATES EXAMINED, 1943-1947

In table 24 are tabulated the number of candidates examined for medical licensure in the United States and its territories and possessions for the five year period from 1943 to 1947. For each year there is recorded the number who passed and failed licensing examinations. Totals for the five years and the percentage of candidates who failed are also given.

In the five year period shown 35,882 examinations were given; 32,071 were successful tests and 3,811, 10.6 per cent, resulted in failures. New York leads in the number of examinations given. In this state 2,412 applicants were passed. More than 2,000 also were successful in California, Illinois and Pennsylvania. More than 1,000 were passed at examinations in Florida, Louisiana, Maryland, Michigan, Minnesota, Missouri, Ohio and Texas. The greatest percentage of failures, 59 per cent, occurred in Massachusetts. The majority of those failing in Massachusetts represent graduates of unapproved medical schools and graduates of schools of osteopathy. The number failing will probably decrease since the schools whose graduates were, by law, tested in this state are no longer operating. Furthermore, the State Approving Authority has ruled that students matriculating after Jan. 1, 1941 in institutions not meeting the standards of this authority will not be eligible for licensure. New York's percentage of failures, 44.3, was second highest. This state examines a considerable number of graduates of foreign

TABLE 23.--*States Requiring Annual Registration*

| | Fee | | Fee | | Fee |
|---|---|---|---|---|---|
| Alaska | $10 | Indiana | c | North Dakota | e |
| Arizona | 3 | Iowa | 1 | Oklahoma | 3 |
| Arkansas | a | Kansas | 1 | Oregon | 10 |
| California | 2 | Louisiana | 2 | Pennsylvania | 1 |
| Colorado | b | Minnesota | 2 | Tennessee | 5 |
| Connecticut | 2 | Missouri* | 1 | Texas | 2 |
| Dist. of Columbia | 2 | Montana | d | Utah | 3 |
| Florida | 1 | Nebraska | 1 | Virginia | 1 |
| Georgia | None | Nevada | 2 | Washington | 5 |
| Hawaii | 2 | New Mexico | f | Wisconsin | 3 |
| Idaho | 2 | New York* | 4 | Wyoming | 2.50 |

a. Residents, $2, Nonresidents $4. c. Residents $5, Nonresidents $10. e. Residents $5, Nonresidents $2. Biennial
b. Residents $2, Nonresidents $10. d. Residents $5, Nonresidents $1. f. Residents $2, Nonresidents $5. registration

medical schools, many of whom do not pass on first examination. Regulations admitting certain graduate of unapproved and osteopathic schools to its licensure examinations resulted in a high percentage of failures in 1947. Other high percentages occurred in Connecticut, Nevada and New Hampshire. Twenty-five states failed less than 5 per cent of those examined in the five year period. Twelve states had no

mation of the number of physicians added to the profession by the written examination method. Table 14, page 621 represents actual additions to the medical profession for this period.

## REGISTRATION, 1904-1947

A recapitulation of the totals discussed in this study and for forty-three previous years (1904-1947) is given in table 25.

TABLE 24.--*Candidates Examined, 1943-1947*

| | 1943 | | 1944 | | 1945 | | 1946 | | 1947 | | Total for Five Years | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | P | F | P | F | P | F | P | F | P | F | P | F | %F |
| Alabama | 20 | 0 | 20 | 0 | 23 | 0 | 20 | 0 | 97 | 0 | 180 | 0 | 0.0 |
| Arizona | 6 | 0 | 12 | 0 | 11 | 0 | 12 | 1 | 19 | 3 | 60 | 4 | 6.2 |
| Arkansas | 65 | 0 | 115 | 0 | 65 | 0 | 63 | 0 | 54 | 0 | 362 | 0 | 0.0 |
| California | 507 | 12 | 458 | 14 | 467 | 11 | 530 | 11 | 503 | 10 | 2,465 | 58 | 2.3 |
| Colorado | 113 | 3 | 79 | 3 | 66 | 0 | 77 | 0 | 95 | 0 | 430 | 6 | 1.4 |
| Connecticut | 62 | 12 | 34 | 18 | 31 | 12 | 55 | 10 | 49 | 17 | 231 | 69 | 23.0 |
| Delaware | 9 | 0 | 27 | 0 | 5 | 0 | 16 | 1 | 18 | 0 | 75 | 1 | 1.3 |
| District of Columbia | 42 | 2 | 26 | 2 | 20 | 1 | 41 | 0 | 39 | 0 | 168 | 5 | 2.9 |
| Florida | 129 | 8 | 130 | 9 | 198 | 37 | 373 | 62 | 314 | 17 | 1,144 | 133 | 10.4 |
| Georgia | 195 | 0 | 125 | 1 | 124 | 0 | 168 | 2 | 129 | 0 | 741 | 3 | 0.4 |
| Idaho | 9 | 1 | 15 | 0 | 18 | 0 | 54 | 0 | 62 | 0 | 158 | 1 | 0.6 |
| Illinois | 391 | 29 | 218 | 25 | 415 | 31 | 751 | 33 | 605 | 16 | 2,380 | 16 | 0.7 |
| Indiana | 233 | 0 | 126 | 0 | 231 | 0 | 139 | 16 | 111 | 12 | 840 | 28 | 3.2 |
| Iowa | 106 | 8 | 83 | 8 | 68 | 1 | 57 | 4 | 55 | 0 | 369 | 21 | 5.4 |
| Kansas | 86 | 0 | 179 | 0 | 101 | 0 | 102 | 0 | 86 | 0 | 554 | 0 | 0.0 |
| Kentucky | 161 | 1 | 78 | 0 | 76 | 0 | 166 | 0 | 90 | 0 | 571 | 1 | 0.1 |
| Louisiana | 228 | 2 | 255 | 4 | 208 | 1 | 189 | 1 | 225 | 1 | 1,105 | 9 | 0.8 |
| Maine | 29 | 3 | 13 | 3 | 9 | 3 | 45 | 4 | 31 | 2 | 127 | 15 | 10.6 |
| Maryland | 296 | 14 | 151 | 4 | 193 | 8 | 204 | 4 | 175 | 6 | 1,019 | 36 | 3.4 |
| Massachusetts | 257 | 294 | 162 | 261 | 124 | 175 | 89 | 163 | 84 | 140 | 716 | 1,033 | 59.0 |
| Michigan | 299 | 2 | 189 | 0 | 194 | 0 | 215 | 0 | 116 | 0 | 1,013 | 2 | 0.2 |
| Minnesota | 290 | 0 | 197 | 0 | 217 | 0 | 313 | 0 | 248 | 0 | 1,265 | 0 | 0.0 |
| Mississippi | 113 | 1 | 71 | 0 | 50 | 0 | 45 | 0 | 59 | 0 | 338 | 1 | 0.3 |
| Missouri | 421 | 1 | 207 | 0 | 258 | 1 | 251 | 1 | 265 | 0 | 1,402 | 3 | 0.2 |
| Montana | 4 | 0 | 3 | 0 | 2 | 0 | 17 | 0 | 8 | 0 | 34 | 0 | 0.0 |
| Nebraska | 155 | 15 | 81 | 11 | 74 | 7 | 81 | 5 | 87 | 3 | 478 | 41 | 7.8 |
| Nevada | 0 | 1 | 1 | 0 | 1 | 1 | 15 | 3 | 8 | 0 | 25 | 5 | 16.7 |
| New Hampshire | 5 | 4 | 9 | 4 | 6 | 1 | 20 | 4 | 10 | 0 | 50 | 13 | 20.6 |
| New Jersey | 150 | 11 | 104 | 11 | 95 | 9 | 116 | 5 | 89 | 13 | 554 | 49 | 8.0 |
| New Mexico | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 3 | 0 | 0.0 |
| New York | 634 | 443 | 454 | 362 | 287 | 247 | 427 | 386 | 610 | 482 | 2,412 | 1,920 | 44.3 |
| North Carolina | 115 | 0 | 105 | 0 | 132 | 1 | 95 | 0 | 113 | 1 | 560 | 2 | 0.4 |
| North Dakota | 1 | 0 | 3 | 0 | 4 | 0 | 13 | 0 | 25 | 0 | 46 | 0 | 0.0 |
| Ohio | 622 | 22 | 329 | 25 | 325 | 13 | 340 | 10 | 297 | 3 | 1,913 | 73 | 3.6 |
| Oklahoma | 114 | 0 | 72 | 0 | 69 | 0 | 68 | 0 | 72 | 0 | 395 | 0 | 0.0 |
| Oregon | 52 | 5 | 11 | 5 | 19 | 1 | 50 | 3 | 80 | 0 | 212 | 14 | 6.2 |
| Pennsylvania | 475 | 12 | 853 | 20 | 426 | 13 | 463 | 3 | 437 | 3 | 2,654 | 51 | 1.8 |
| Rhode Island | 20 | 0 | 13 | 3 | 6 | 0 | 40 | 0 | 32 | 0 | 111 | 3 | 2.6 |
| South Carolina | 91 | 0 | 51 | 1 | 58 | 0 | 53 | 0 | 55 | 0 | 308 | 1 | 0.3 |
| South Dakota | 6 | 0 | 3 | 0 | 6 | 0 | 10 | 0 | 18 | 0 | 43 | 0 | 0.0 |
| Tennessee | 201 | 0 | 237 | 0 | 193 | 2 | 157 | 1 | 110 | 0 | 898 | 3 | 0.3 |
| Texas | 195 | 4 | 303 | 3 | 228 | 7 | 266 | 14 | 282 | 13 | 1,274 | 41 | 3.1 |
| Utah | 27 | 0 | 30 | 0 | 13 | 0 | 79 | 0 | 0 | 0 | 149 | 0 | 0.0 |
| Vermont | 19 | 0 | 7 | 0 | 2 | 0 | 5 | 0 | 27 | 1 | 60 | 1 | 1.6 |
| Virginia | 264 | 1 | 158 | 9 | 39 | 2 | 174 | 2 | 130 | 4 | 765 | 18 | 2.3 |
| Washington | 54 | 1 | 76 | 0 | 35 | 0 | 130 | 0 | 116 | 0 | 411 | 1 | 0.2 |
| West Virginia | 23 | 0 | 24 | 0 | 20 | 0 | 64 | 0 | 40 | 0 | 171 | 0 | 0.0 |
| Wisconsin | 179 | 0 | 74 | 0 | 96 | 0 | 123 | 1 | 143 | 0 | 615 | 1 | 0.2 |
| Wyoming | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 |
| U.S. Territories & Poss. | 14 | 2 | 39 | 0 | 35 | 2 | 74 | 4 | 55 | 3 | 217 | 11 | 3.9 |
| Total Examined | 8,402 | | 6,816 | | 5,930 | | 7,610 | | 7,124 | | 35,882 | | |
| Passed | 7,488 | | 6,010 | | 5,343 | | 6,856 | | 6,374 | | 32,071 | | |
| Failed | 914 | | 806 | | 587 | | 754 | | 750 | | 3,811 | | |
| Percentage Failed | 10.9 | | 11.8 | | 9.9 | | 9.9 | | 10.5 | | 10.6 | | |

failures. The percentage of failures has remained practically constant, the low being 9.9 per cent in 1945 and 1946 and the high 11.8 per cent in 1944.

These figures represent examinations given and not individuals. A candidate who fails more than once in a state in a given year is counted only once, but should he also fail in a succeeding year he is also counted in that year. A successful candidate securing a license in more than one state in a given year is counted in both states and likewise counted if he is passed at examinations in later years. These figures give only a fair approxi-

This tabulation covers physicians registered by written examination and by reciprocity or endorsement of credentials. Likewise shown are the numbers who failed annually in forty-four years and the percentage of failures each year and, lastly, the total annual registration. No obvious trend in the numbers registered is evident from 1904 to 1933 except in 1918, when 4,231 were licensed, the lowest registration in forty-four years. Beginning in 1933 there was an upward trend through 1941. The decrease of more than 1200 in 1918 was due to the withdrawal of physicians and recent graduates for the armed forces in

World War I. By contrast, in 1943 the numbers increased by a similar figure over the preceding year. The increase was the result of the accelerated curriculum and efforts made to maintain civilian care at as high a level as possible and still provide for the military exigencies. In 1943 more physicians were examined than in any previous year.

The registrations in 1946 numbered almost twice as many as in 1945. Separation from service of a large number of medical officers and their return to private practice in states other than those in which they were licensed accounts in large part for this increase. This trend was again evident in 1947, although to a lesser extent. The majority of those registered by the examination method, however, represent the current graduates of a given year.

In analyzing this table it should be remembered that the figures refer to examinations given rather than to individuals examined.

### GRADUATES OF APPROVED SCHOOLS AND OTHERS REGISTERED, 1922-1927

The educational fitness of physicians registered for the practice of medicine in twenty- computation of these figures, schools rated as class A and B by the Council on Medical Education and Hospitals of the American Medical Association since 1907 are classified as approved. In the column "Others" are included individuals who graduated prior to 1907, when the first classification of schools was made, graduates of foreign faculties of medicine, Class C graduates, osteopaths given recognition by medical licensing boards and graduates of schools not approved by the

TABLE 25.--*Registration of Physicians, 1904-1947*

| Year | Examined | Passed | Percentage Failed | Reciprocity or Endorsement | Total Registerd |
|---|---|---|---|---|---|
| 1904 | 7,056 | 5,693 | 19.3 | 1,005 | 6,698 |
| 1905 | 7,178 | 5,688 | 20.8 | 394 | 6,082 |
| 1906 | 8,040 | 6,373 | 20.7 | 1,502 | 7,875 |
| 1907 | 7,270 | 5,731 | 21.3 | 1,427 | 7,158 |
| 1908 | 7,775 | 6,089 | 21.7 | 1,284 | 7,373 |
| 1909 | 7,295 | 5,865 | 19.6 | 1,381 | 7,246 |
| 1910 | 7,011 | 5,719 | 18.4 | 1,640 | 7,359 |
| 1911 | 6,964 | 5,582 | 19.8 | 1,243 | 6,825 |
| 1912 | 6,880 | 5,467 | 20.5 | 1,273 | 6,740 |
| 1913 | 6,453 | 5,253 | 18.6 | 1,292 | 6,545 |
| 1914 | 5,579 | 4,379 | 21.5 | 1,439 | 5,818 |
| 1915 | 5,334 | 4,507 | 15.5 | 1,399 | 5,906 |
| 1916 | 4,878 | 4,151 | 14.9 | 1,353 | 5,504 |
| 1917 | 4,754 | 4,085 | 14.0 | 1,360 | 5,445 |
| 1918 | 3,667 | 3,184 | 13.2 | 1,047 | 4,231 |
| 1919 | 4,750 | 4,074 | 14.2 | 2,546 | 6,620 |
| 1920 | 4,796 | 4,062 | 15.3 | 2,558 | 6,620 |
| 1921 | 4,825 | 4,228 | 12.4 | 2,186 | 6,414 |
| 1922 | 4,031 | 3,539 | 12.2 | 2,073 | 5,612 |
| 1923 | 4,727 | 4,028 | 14.8 | 2,405 | 6,433 |
| 1924 | 5,392 | 4,756 | 11.8 | 1,923 | 6,679 |
| 1925 | 6,002 | 5,450 | 9.2 | 1,861 | 7,311 |
| 1926 | 5,770 | 5,314 | 7.9 | 1,955 | 7,269 |
| 1927 | 5,389 | 5,002 | 7.2 | 2,176 | 7,178 |
| 1928 | 5,458 | 5,090 | 6.7 | 2,228 | 7,318 |
| 1929 | 5,629 | 5,282 | 6.2 | 2,420 | 7,702 |
| 1930 | 5,571 | 5,255 | 5.7 | 2,366 | 7,621 |
| 1931 | 5,611 | 5,263 | 6.2 | 2,211 | 7,476 |
| 1932 | 5,675 | 5,247 | 7.6 | 1,886 | 7,133 |
| 1933 | 5,673 | 5,244 | 7.6 | 1,989 | 7,233 |
| 1934 | 6,145 | 5,628 | 8.4 | 2,161 | 7,789 |
| 1935 | 6,443 | 5,859 | 9.1 | 2,194 | 8,053 |
| 1936 | 6,917 | 6,223 | 10.0 | 2,773 | 8,996 |
| 1937 | 7,334 | 6,604 | 10.0 | 3,205 | 9,809 |
| 1938 | 7,461 | 6,589 | 11.7 | 2,956 | 9,545 |
| 1939 | 7,754 | 6,493 | 16.3 | 2,872 | 9,365 |
| 1940 | 7,926 | 6,291 | 20.7 | 2,866 | 9,157 |
| 1941 | 7,539 | 6,057 | 19.7 | 2,760 | 8,817 |
| 1942 | 7,222 | 6,119 | 15.4 | 2,469 | 8,588 |
| 1943 | 8,402 | 7,488 | 10.9 | 2,340 | 9,828 |
| 1944 | 6,816 | 6,010 | 11.8 | 2,596 | 8,606 |
| 1945 | 5,930 | 5,343 | 9.9 | 3,621 | 8,964 |
| 1946 | 7,610 | 6,856 | 9.9 | 9,669 | 16,525 |
| 1947 | 7,124 | 6,374 | 10.5 | 7,682 | 14,056 |

The percentage of failures gradually dropped from 19.3 in 1904, when a great many proprietary medical schools were functioning, to 5.7 in 1930. Improvements in the standards of medical education are reflected in this decrease of failures in licensing examinations. With the migration of European physicians to this country beginning in 1936 and the resultant licensure difficulties, the proportion of failures began to rise, reaching another peak of 20.7 per cent in 1940.

Council. In 1928 the classification A, B and C by the Council was discontinued and a list of approved medical schools has since been maintained.

There were 14,056 candidates registered in 1946, of whom 13,038 (92.8 per cent) represented graduates of approved schools and 1,018 (7.2 per cent) were in the second group. In the twenty-six year period there were 198,963 registrations of approved graduates (89.1 per cent) and 24,102 others (10.8 per

cent). Until the influx of foreign graduates in 1936 and the concessions made to unapproved graduates those in the second group were fewer than 1,000 annually.

### GRADUATES OF UNAPPROVED SCHOOLS REGISTERED, 1942-1947

Graduates of institutions which do not meet the educational standards outlined by the House of Delegates of the American Medical Association and administered by the Council on Medical Education and Hospitals were register-

TABLE 26.--*Graduates of Approved Schools and Others Registered, 1922-1947*

| | Graduates of Approved Schools | | Others | | |
|---|---|---|---|---|---|
| | Number | Per Cent of Total | Number | Per Cent of Total | Totals |
| 1922..... | 4,519 | 80.5 | 1,093 | 19.5 | 5,612 |
| 1923..... | 5,196 | 80.8 | 1,237 | 19.2 | 6,433 |
| 1924..... | 5,687 | 85.1 | 992 | 14.9 | 6,679 |
| 1925..... | 6,314 | 86.4 | 997 | 13.6 | 7,311 |
| 1926..... | 6,441 | 88.7 | 828 | 11.3 | 7,269 |
| 1927..... | 6,410 | 89.4 | 768 | 10.6 | 7,178 |
| 1928..... | 6,585 | 90.1 | 733 | 9.9 | 7,318 |
| 1929..... | 7,003 | 91.0 | 699 | 9.0 | 7,702 |
| 1930..... | 7,011 | 92.1 | 610 | 7.9 | 7,621 |
| 1931..... | 6,932 | 92.8 | 544 | 7.2 | 7,476 |
| 1932..... | 6,676 | 92.1 | 457 | 6.3 | 7,133 |
| 1932..... | 6,774 | 93.7 | 459 | 6.3 | 7,233 |
| 1934..... | 7,172 | 92.1 | 617 | 7.9 | 7,789 |
| 1935..... | 7,360 | 91.3 | 693 | 8.5 | 8,053 |
| 1936..... | 7,933 | 88.1 | 1,063 | 11.8 | 8,996 |
| 1937..... | 8,391 | 85.5 | 1,418 | 14.4 | 9,809 |
| 1938..... | 8,315 | 87.1 | 1,230 | 12.9 | 9,545 |
| 1939..... | 8,067 | 86.2 | 1,298 | 13.8 | 9,365 |
| 1940..... | 7,781 | 85.0 | 1,376 | 15.0 | 9,157 |
| 1941..... | 7,768 | 87.9 | 1,049 | 11.9 | 8,817 |
| 1942..... | 7,290 | 84.9 | 1,298 | 15.1 | 8,588 |
| 1943..... | 8,640 | 87.9 | 1,188 | 12.2 | 9,828 |
| 1944..... | 7,736 | 89.8 | 870 | 10.1 | 8,606 |
| 1945..... | 8,232 | 91.8 | 732 | 8.1 | 8,964 |
| 1946..... | 15,692 | 94.9 | 835 | 5.1 | 16,527 |
| 1947..... | 13,038 | 92.8 | 1,018 | 7.2 | 14,056 |
| Total..... | 198,963 | 89.1 | 24,102 | 10.8 | 223,065 |

ed in twenty states and Hawaii during the last six years. The number so registered will be found in table 27. Figures are given separately for those licensed by written examination and by endorsement of credentials. In the six years shown 1160 were registered, 1,160 by examination and 21 without written examination.

New York, which has made certain concessions; Illinois, which accepts for licensure the graduates of an unapproved school located in that state, and Massachusetts licensed the largest number of graduates of unapproved schools. In the last mentioned state the institutions referred to in the table were not granted approval by the State Approving Authority. Matriculants after Jan. 1, 1941 are not eligible for licensure in Massachusetts. Regulations have become effective in Florida, Ohio and a few other states providing for licensure of unapproved graduates under certain conditions.

### GRADUATES OF SCHOOLS OF OSTEOPATHY REGISTERED BY MEDICAL EXAMINING BOARDS 1942-1947

The number of graduates of schools of osteopathy granted the privilege of practicing medicine or surgery or both by seventeen examining boards for six years (1942-1947) are given in table 28. There have been 1,192 such individuals registered, 933 by examination and and 259 without examination.

Following is a summary of the situation in the sixteen states and the District of Columbia providing for the licensure of osteopaths by the medical examining board.

TABLE 27.—*Graduates of Unapproved Medical Schools Registered, 1942-1947*

| | Examination | | | | | | Reciprocity & Endorsement | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1942 | 1943 | 1944 | 1945 | 1946 | 1947 | 1942 | 1943 | 1944 | 1945 | 1946 | 1941 | |
| Arizona..... | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 2 |
| California..... | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 4 |
| Florida..... | 0 | 0 | 0 | 0 | 0 | 11 | 0 | 0 | 0 | 0 | 0 | 0 | 11 |
| Illinois..... | 51 | 57 | 45 | 115 | 45 | 34 | 0 | 0 | 0 | 0 | 1 | 0 | 348 |
| Indiana..... | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| Iowa..... | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 2 |
| Kentucky..... | 0 | 2 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| Massachusetts. | 105 | 177 | 102 | 26 | 24 | 27 | 0 | 0 | 0 | 0 | 0 | 0 | 461 |
| Mississippi..... | 1 | 0 | 1 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 |
| Missouri..... | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 3 |
| Nebraska..... | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| Nevada..... | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| New Hampshire | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 2 |
| New Mexico.... | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 3 |
| New York..... | 0 | 0 | 0 | 0 | 111 | 82 | 0 | 0 | 0 | 0 | 0 | 0 | 243 |
| Ohio..... | 0 | 0 | 0 | 0 | 6 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 10 |
| Texas..... | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| Virginia..... | 0 | 1 | 5 | 3 | 10 | 4 | 0 | 0 | 0 | 0 | 1 | 0 | 24 |
| Washington.... | 0 | 0 | 0 | 0 | 2 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 6 |
| Wisconsin..... | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Hawaii..... | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Totals..... | 157 | 240 | 153 | 166 | 204 | 250 | 1 | 1 | 2 | 10 | 7 | 9 | 1,194 |

Alabama last year registered a graduate of a school of mechanotherapy.

In Colorado an osteopath receives a license to practice medicine. In Connecticut any registered osteopath may practice either medicine or surgery or both, as the case may be, if he passes a satisfactory examination before the medical examining board. In Delaware osteopaths

TABLE 28.—*Graduates of Schools of Osteopathy Registered by Medical Boards, 1942-1947*

| | Examination | | | | | | Reciprocity & Endorsement | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1942 | 1943 | 1944 | 1945 | 1946 | 1947 | 1942 | 1943 | 1944 | 1945 | 1946 | 1941 | |
| Alabama..... | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Colorado..... | 9 | 9 | 7 | 7 | 5 | 11 | 0 | 0 | 0 | 0 | 0 | 0 | 48 |
| Connecticut.... | 0 | 5 | 5 | 2 | 5 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 20 |
| Delaware..... | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dist. Columbia | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 6 |
| Indiana..... | 4 | 2 | 3 | 0 | 45 | 0 | 2 | 3 | 3 | 2 | 7 | 0 | 74 |
| Massachusetts. | 13 | 5 | 4 | 5 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 29 |
| Nebraska..... | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 2 | 0 | 0 | 0 | 3 |
| New Hampshire | 0 | 0 | 2 | 0 | 0 | 0 | 1 | 1 | 2 | 0 | 0 | 0 | 4 |
| New Jersey.... | 9 | 18 | 20 | 15 | 9 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 80 |
| New York..... | 0 | 0 | 0 | 0 | 5 | 134 | 0 | 0 | 0 | 0 | 0 | 0 | 139 |
| Ohio..... | 0 | 158 | 72 | 46 | 47 | 12 | 0 | 0 | 2 | 1 | 7 | 10 | 356 |
| Oregon..... | 1 | 0 | 0 | 0 | 0 | 0 | 3 | 3 | 0 | 1 | 12 | 10 | 30 |
| Texas..... | 17 | 16 | 35 | 29 | 42 | 38 | 1 | 2 | 1 | 1 | 0 | 0 | 181 |
| Virginia..... | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Wisconsin..... | 5 | 6 | 0 | 1 | 1 | 0 | 1 | 16 | 2 | 16 | 11 | 9 | 67 |
| Wyoming..... | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 2 | 1 | 0 | 0 | 6 |
| Totals..... | 60 | 227 | 148 | 109 | 156 | 210 | 11 | 27 | 24 | 29 | 45 | 110 | 1,192 |

are licensed as "osteopathic physicians." In the District of Columbia osteopaths are granted the right to practice surgery. In Indiana the licenses issued to osteopaths under a 1945 amendment to the medical practice act authorize the holders to practice medicine and surgery. Licentiates in osteopathy prior to 1945 have now been authorized to practice osteopathy, surgery and obstetrics. In Massachusetts the medical practice act, by definition, includes osteopathy in the practice of medicine and does not differentiate the type of license issued to an osteopathic applicant. According to a law passed in Nebraska in 1943, "any

person now licensed to practice osteopathy may, if application is made prior to July 1, 1948 and upon payment of the prescribed fee, take the first regular examination given after the application is made before the Board of Examiners in Medicine....If successful he or she shall receive a license to practice medicine and surgery in the state." In New Hampshire osteopaths are granted the right to practice medicine and surgery.

New Jersey provides that osteopaths licensed prior to Nov. 1, 1941 who furnish proof prior to that date of having served for a period of two years as an intern or resident surgeon in an osteopathic or medical hospital approved by the board of medical examiners, of having completed a postgraduate course of two years in a college of osteopathy or medicine approved by the board or of having had at least three years of practice in a hospital approved by the board can be admitted to an examination in pharmacology, therapeutics and surgery and, if successful, can obtain a license to practice medicine and surgery. Since 1941 all osteopathic applicants who have met the requirements of the medical practice act have been licensed to practice medicine and surgery.

In New York a law approved April 10, 1946 provides that any osteopathic licentiate who had obtained the additional right to use instruments for minor surgical procedures and to use anesthetics, antiseptics, narcotics and biological products or any applicant who has met or shall meet all the preliminary and professional requirements as required as of September first, nineteen hundred thirty-six and has satisfactorily passed or shall satisfactorily pass the regular medical licensing examination shall be granted the right to practice medicine without limitation as defined by the statutes of the State of New York.

A law passed in Ohio in 1943 gives osteopaths who obtain their licenses under that act the right to practice osteopathic medicine and surgery. In Oregon they are granted the right to practice "in the subjects" covered by the examination, which includes surgery. The medical practice act of Texas provides for the issuing of a license to practice medicine only, and osteopaths are issued licenses unrestricted in scope. In Virginia osteopaths may obtain the right to use drugs and perform surgery with the use of instruments if they satisfy the board of medical examiners that they are qualified to do so. Wisconsin grants osteopaths the privilege to practice surgery, and in Wyoming the statutes contain no specific provision for the licensing of osteopaths. The medical practice act of the latter state provides that the certificate issued to all applicants "shall be deemed licenses to practice medicine in all branches in which the applicant has taken examination in the state."

## PHYSICIANS EXAMINED ON BASIS OF CREDENTIALS OBTAINED IN COUNTRIES OTHER THAN THE UNITED STATES AND CANADA

The Council on Medical Education and Hospitals does not grade or classify medical schools outside the United States and Canada. It does not attempt to evaluate institutions which it is not in a position to visit to determine whether they meet the minimal essentials of an acceptable medical school as outlined by the Council. This was true even before the war.

For a period of twelve years beginning in 1926 the credentials of physicians coming from abroad were verified by the Council through official correspondence with the medical schools directly or through the diplomatic services. Prior to the onset of the war in Europe it was necessary to discontinue this effort, and on the licensing boards rests the responsibility of evaluating the credentials presented by these graduates. In the 1942 edition of the American Medical Directory a symbol in the biographic data of foreign graduates, the key number of the foreign school and the year of graduation given is the licensing board's record of the credential accepted as meeting the educational qualifications for licensure. The absence of the symbol may be interpreted to indicate that official verification is on file in the office of the Council.

A committee composed of representatives of various interested organizations has been formed to consider the problem of evaluation of foreign credentials submitted by physicians and students from foreign medical schools. This committee met in 1947 and again in 1948. No positive recommendations emerged from this meeting, but the discussions will be continued and an attempt made to obtain pertinent data pertaining to schools and educational procedures in all countries. Addresses presented at the Annual Congress on Medical Education and Licensure in February 1948 by physicians who visited medical schools in other countries and already published in THE JOURNAL[2] should be helpful to those charged with the responsibility of evaluating foreign credentials.

The requirements of candidates for medical licensure in the United States, Alaska, Hawaii and Puerto Rico on the basis of credentials obtained in countries other than the United States and Canada are given in table 29. Twenty-one states report that the holders of such credentials are not eligible for licensure. Eighteen states, Alaska, Hawaii and Puerto Rico require full citizenship and seven states, naturalization papers as a condition precedent to taking the examination. The District of Columbia, Indiana and Washington make no reference to citizenship. In some states the recognition or nonrecognition of such individuals is by rule of the board; in others the provision is by statute. Nine states and Alaska which will admit foreign graduates to

2. J. A. M. A. 137:5 (May 1) 1948.

**TABLE 29.—*Requirements of Candidates for Medical Licensure on the Basis of Credentials Obtained in Countries Other Than the United States and Canada.***

| | Admitted to Examination | Admitted by Endorsement of State Licensure | Citizenship | Basic Science Certificate | Internship in Hospital in United States | Further Medical Training | Examination Fee, Dollars | Other Requirements |
|---|---|---|---|---|---|---|---|---|
| Alabama | X | .. | X | .. | X | .. | 10 | 1 |
| Arizona | Not accepted | | | | | | | |
| Arkansas (reg. and homeo. boards) | Not accepted | | | | | | | |
| California | x | x21 | x6 | .. | x18 | x18 | 25 | 13 |
| Colorado | Not accepted | | | | | | | |
| Connecticut (regular board) | x | x | 1st P | x | .. | .. | 25 | .. |
| Delaware (regular board) | x | .. | x | .. | x | .. | 25 | 5,22 |
| District of Columbia | x | x8 | .. | x | x | .. | 25 | 19 |
| Florida | x | .. | x | x | .. | x7 | 25 | .. |
| Georgia | Not accepted | | | | | | | |
| Idaho | Not accepted | | | | | | | |
| Illinois | x | .. | 1st P | .. | x | .. | 15 | .. |
| Indiana | x | x | .. | .. | .. | x7 | 25 | .. |
| Iowa | x10 | .. | x | x | x2 | x2 | 25 | .. |
| Kansas | x | .. | x | .. | x24 | .. | 25 | 11 |
| Kentucky | Not accepted | | | | | | | |
| Louisiana (reg. and homeo. boards) | Not accepted | | | | | | | |
| Maine | x | x | x | .. | x | .. | 27 | 11,20 |
| Maryland (reg. and homeo. boards) | x | .. | 1st P | .. | x26 | .. | 25 | 19 |
| Massachusetts | x | .. | 1st P | .. | .. | .. | 25 | .. |
| Michigan | x | x | x | x | x | x9 | 25 | .. |
| Minnesota | Not accepted | | | | | | | |
| Mississippi | x | .. | x | .. | x | .. | 103 | .. |
| Missouri | x | .. | x | .. | x | .. | 15 | .. |
| Montana | Not accepted 25 | | | | | | | |
| Nebraska | x | x | x | x | .. | .. | 25 | .. |
| Nevada | Not accepted | | | | | | | |
| New Hampshire | x | x15 | x | .. | x | .. | 20 | .. |
| New Jersey | x | x | x | .. | x17 | .. | 25 | 27 |
| New Mexico | Not accepted | | | | | | | |
| New York | x | x | 1st P | .. | .. | .. | 25 | 14 |
| North Carolina | Not accepted | | | | | | | |
| North Dakota | x | .. | x | .. | x | .. | 25 | 11 |
| Ohio | x | x | x | .. | .. | .. | 25 | 13 |
| Oklahoma | Not accepted | | | | | | | |
| Oregon | Not accepted | | | | | | | |
| Pennsylvania | x | .. | 1st P | .. | x | .. | 25 | .. |
| Rhode Island | x | .. | 1st P | x | x | x | 20 | 28 |
| South Carolina | Not accepted | | | | | | | |
| South Dakota | Not accepted | | | | | | | |
| Tennessee | x | 15 | x | x | .. | .. | 25 | 4 |
| Texas | x | x | x | .. | .. | .. | 25 | .. |
| Utah | Not accepted | | | | | | | |
| Vermont | Not accepted | 23 | | | | | | |
| Virginia | x | .. | x | 15 | 15 | | 25 | .. |
| Washington | x | .. | .. | x | x | x7 | 25 | 9 |
| West Virginia | Not accepted | | | | | | | |
| Wisconsin | Not accepted | | | | | | | |
| Wyoming | Not accepted | | | | | | | |
| Alaska | x | x | x | x | x | .. | 25 | |
| Hawaii | x | .. | x | .. | x | .. | 25 | 12 |
| Puerto Rico | x | x | x | .. | x | .. | 25 | .. |

*Refer to chart of "Reciprocity and Endorsement Policies" for further data.

1. Certificate of National Board of Medical Examiners required.
2. Internship or one year in medical school in United States.
3. Certificate of National Board of Medical Examiners.
4. European graduates after 1939 limited to English speaking schools.
5. Residence of one year in Delaware.
6. If similar privileges are accorded licentiates of District of Columbia by licensing agency of jurisdiction from which applicant comes.
7. Senior year in an approved medical school in United States or Canada, possess the degree of Master of Public Health from an acceptable school, or satisfactorily complete a one year's assistant residency, residency or fellowship in an approved hospital.
8. Not required if country in which applicant is licensed will admit to practice citizens of the United States licensed to practice in some state or upon proof of requirements similar to those required by California of graduates of foreign medical schools.
9. Enemy aliens not accepted.
10. Application must be filed six months prior to date of examination.
11. Licensed to practice medicine and surgery in country in which school of graduation is located, otherwise required to complete senior year in approved medical school in United States.
12. Diplomates of National Board of Medical Examiners eligible.
13. License to practice medicine and surgery in the country in which the school of graduation is located. Applicants limited to University Schools of Great Britain.
14. Matriculants after January 1, 1940 not accepted.
15. At the discretion of the board.
16. Internship and graduate work.
17. Internship completed in foreign countries after July 1, 1934 not acceptable.
18. Rotating internship in approved hospital in the United States or completion of senior year in class A medical school in the United States.
19. These requirements apply also to graduates of Canadian schools.
20. No applications accepted from countries other than England (certain schools), Ireland, Scotland and Australia.
21. Provided standard was the same as California on the same date.
22. Degree from an American medical college acceptable to the Medical Council of Delaware required.
23. Diplomates of the National Board of Medical Examiners accepted. Citizenship required.
24. In lieu of internship, certificate from three graduates of applicant's medical school licensed to practice medicine in United States accepted.
25. Effective July 1, 1943.
26. Homeopathic Board requires one year internship in homeopathic hospital in the United States.
27. Matriculants of medical schools of Europe and Asia after November 19, 1941 not accepted. Graduates of medical schools of South American Republics, Mexico, and Cuba not accepted.
28. License to practice medicine and surgery in country in which school of graduation is located.

TABLE 30.—*Physicians Examined on the Basis of Credentials Obtained in Countries Other Than the United States and Canada, 1947*

| School | 1 California | 2 Colorado | 3 Connecticut | 4 Dist. of Columbia | 5 Florida | 6 Georgia | 7 Illinois | 8 Indiana | 9 Iowa | 10 Kansas | 11 Kentucky | 12 Maine | 13 Maryland | 14 Massachusetts | 15 Mississippi | 16 Missouri | 17 Nebraska | 18 New Jersey | 19 New York | 20 North Carolina | 21 North Dakota | 22 Ohio | 23 Pennsylvania | 24 Rhode Island | 25 South Dakota | 26 Tennessee | 27 Texas | 28 Vermont | 29 Virginia | 30 Washington | 31 Alaska, Hawaii and Puerto Rico | Totals | Examined Passed | Examined Failed | Percentage of Number of Boards Examined by | Marginal Number |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | P F | P F | P F | P F | P F | P F | P F | P F | P F | P F | P F | P F | P F | P F | P F | P F | P F | P F | P F | P F | P F | P F | P F | P F | P F | P F | P F | P F | P F | P F | P F | P F | P F | P F | P F | P F |
| **ALGERIA** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 Ecole de Plein Exercice de Médecine, Alger | | | | | | | | | | | | | | | | | | | 0 1 | | | | | | | | | | | | 1 | 0 | 1 | 100 | 1 | 1 |
| **ARGENTINA** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 Universidad Nacional de Buenos Aires | | | | | | | | | | | | | 1 0 | | | | | | | | | | | | | | | | | | 1 | 1 | 0 | 0 | 1 | 2 |
| **AUSTRIA** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 Leopold Franzens-Universität, Innsbruck | | | | | | | 0 1 | | | | | | | | | | | | | | | | | | | | | | | | 1 | 0 | 1 | 100 | 1 | 3 |
| 4 Universität Wien | 5 0 | 1 0 | 0 1 | | | | 2 1 | | | | 1 0 | | 1 1 | 2 0 | | 2 0 | | 0 1 | 13 36 | | | | 1 0 | | | | 1 0 | | | | | 67 | 29 | 38 | 56.7 | 12 | 4 |
| **BELGIUM** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 Université Libre de Bruxelles | | | | | | | | | | | | | | | | | | | 2 2 | | | | | | | | | | | | 1 0 | 1 | 3 | 2 | 40 | 2 | 5 |
| 6 Universiteit Gent | | | | | | | | | | | | | | 0 1 | | | | | | | | | | | | | | | | | 1 | 0 | 1 | 100 | 1 | 6 |
| 7 Université De Liège | | | | | | | | | | | | | | | | | | | 1 0 | | | | | | | | | | | | 1 | 1 | 0 | 0 | 1 | 7 |
| **BRAZIL** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 Faculdade de Medicina Cirurgia e Pharmacia, Bahia | | | | | | | | | | | | | | | | | | | 0 1 | | | | | | | | | | | | 1 | 0 | 1 | 100 | 1 | 8 |
| 9 Universidade do Rio de Janeiro | | | | | | | | | | | | | | 0 1 | | | | | | | | | | | | | | | | | 1 | 0 | 1 | 100 | 1 | 9 |
| **CHILE** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 Universidad de Chile | | | | | | | | | | | | | | | | | | | 0 1 | | | | | | | | | | | | 1 | 0 | 1 | 100 | 1 | 10 |
| **CHINA** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11 Huang Ya Medical College, Changsha | | | | | | | | | | | | 0 1 | | | | | | | | | | | | | | | | | | | 1 | 0 | 1 | 100 | 1 | 11 |
| 12 Peiping Union Medical College | 1 0 | | | | | | | | | | | | | | | | | | | | | | 1 0 | | | | | | | | 2 | 2 | 0 | 0 | 2 | 12 |
| 13 Pennsylvania Medical School, Shanghai | | | | | | | | | | | | | | | | | | | 0 1 | 1 0 | 1 0 | | | | | | | | | 0 1 | 0 1 | 5 | 2 | 3 | 60 | 5 | 13 |
| **COLOMBIA** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 14 Universidad Nacional Facultad de Medicina, Bogotá | 0 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | 0 | 1 | 100 | 1 | 14 |
| **CUBA** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 15 Universidad de la Habana | 2 1 | | 3 0 | 1 0 | 1 0 | | 7 2 | | | | | | 0 1 | 1 1 | | | | | | | | | | | | | | | | | 20 | 15 | 5 | 25 | 7 | 15 |
| **CZECHOSLOVAKIA** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 16 Univerzita Komenského, Bratislava | | | | | | | 0 1 | | | | | | | 2 0 | | | | 3 4 | | | | | | | | | | | | | 10 | 5 | 5 | 50 | 3 | 16 |
| 17 Masarykova Univerzita, Brno | | | | | | | | | | | | | | | | | | 1 2 | | | | | | | | | | | | | 3 | 1 | 2 | 66.7 | | 17 |
| 18 Deutsche Universität, Prag | | | 1 0 | | | | 1 0 | | | | | | | | | | | 5 8 | | | | 1 0 | | | 1 0 | | | | | | 17 | 9 | 8 | 47.1 | 5 | 18 |
| 19 Univerzita Karlova, Praha | | | 0 2 | | | | 0 1 | | | | | | | 0 1 | | | | 9 7 | | | | | | | | | | | | | 20 | 9 | 11 | 45 | 4 | 19 |
| **EL SALVADOR** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 20 Universidad de El Salvador | 0 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | 0 | 1 | 100 | 1 | 20 |
| **ENGLAND** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 21 University of Bristol | 1 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | 1 | 0 | 0 | 1 | 21 |
| 22 University of London | | | | | | | | | | | | | 1 0 | | | | | | 1 0 | | | | | | | | | | | | 2 | 2 | 0 | 0 | 2 | 22 |
| 23 University of Oxford | | | | | | | | | | | | | 1 0 | | | | | | | | | | | | | | | | | | 1 | 1 | 0 | 0 | 1 | 23 |
| 24 Licentiate of the Royal College of Physicians and Member of the Royal College of Surgeons, London | | | | | | | | | | | | | 1 0 | | | | | | 1 1 | | | | | | | | | | | | 3 | 2 | 1 | 33.3 | 2 | 24 |
| **FINLAND** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 25 Helsingfors Universität | | | | | | | | | | | | | | | | | | | 0 1 | | | | | | | | | | | | 1 | 0 | 1 | 100 | 1 | 25 |
| **FRANCE** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 26 Université d'Aix-Marseille | | | | | | | | | | | | | | | | | | | 0 1 | | | | | | | | | | | | 1 | 0 | 1 | 100 | 1 | 26 |
| 27 Université de Montpellier | | | | 1 0 | | | 0 1 | | | | | | | | | | | | 0 2 | | | | | | | | | | | | 4 | 1 | 3 | 75 | 3 | 27 |
| 28 Université de Paris | 2 0 | | 1 0 | | | | | | | | 1 0 | | | 2 0 | | 1 0 | | 1 0 | 4 7 | | | | | | | | | | | | 19 | 12 | 7 | 36.8 | 7 | 28 |
| **GERMANY** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 29 Friedrich-Wilhelms-Universität, Berlin | | | 1 0 | | | | 1 0 | | | | | | 4 0 | | | | | | 9 11 | | | | | | | | | | 1 1 | | 29 | 13 | 16 | 55.2 | 5 | 29 |
| 30 Rheinische Friedrich-Wilhelms Universität, Bonn | | | 1 0 | | | | | | | | | | | | | | | | 2 1 | | | | | | | | | | | | 4 | 3 | 1 | 25 | 2 | 30 |
| 31 Schlesische Friedrich-Wilhelms Universität, Breslau | | | | | | | 1 0 | 1 0 | | | | | | | | | | | 0 1 | | | | | | | | | | | | 3 | 2 | 1 | 33.3 | 3 | 31 |
| 32 Friedrich-Alexanders Universität, Erlangen | | | | | | | | | | | | | | | | | | | 0 1 | | | | | | | | | | | | 1 | 0 | 1 | 100 | 1 | 32 |
| 33 Johann Wolfgang Goethe Universität, Frankfurt-am-Main | | | | | | | | | | | | | | | | | | | 0 1 | | | | | | | | | | | | 1 | 0 | 1 | 100 | 1 | 33 |
| 34 Albert-Ludwigs Universität, Freiburg | 1 0 | 1 0 | | | | | 1 1 | | | | | | | | | | | | 0 1 | | | | | 1 0 | | | | | | | 4 | 0 | 4 | 0 | 5 | 34 |
| 35 Vereinigten Friedrichs-Universität, Halle, Wittenberg | | | | 1 0 | | | | | | | | | | | | | | | 0 1 | | | | | | | | | | | | 2 | 1 | 1 | 50 | 2 | 35 |
| 36 Hamburgische Universität | | | | | | | | | | | | | | | | | | | 2 4 | | | | | | | | | | | | 6 | 2 | 4 | 66.7 | 1 | 36 |
| 37 Universität Heidelberg | 0 1 | 1 0 | | | | | 0 1 | | | | | | 0 1 | | | | | | 0 1 | | | | | | | | | | | | 1 | 0 | 1 | 100 | 5 | 37 |
| 38 Hessische Ludwigs Universität, Gießen | | | | | | | | | | | | | | | | | | | 0 1 | | | | | | | | | | | | 1 | 0 | 1 | 100 | 1 | 38 |
| 39 Leopold Franzens-Universität, Innsbruck | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | 1 | 0 | 0 | 1 | 39 |
| 40 Thüringische Landesuniversität, Jena | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | 0 | 1 | 100 | 1 | 40 |
| 41 Christian-Albrechts Universität, Kiel | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | 0 | 1 | 100 | 1 | 41 |
| 42 Universität Köln | 1 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | 1 | 0 | 0 | 1 | 42 |
| 43 Albertus-Universität, Königsberg | | | | | | | | | | | | | | | | | | | 2 2 | | | | | | | | | | | | 4 | 2 | 2 | 50 | 2 | 43 |
| 44 Universität Leipzig | | | 1 0 | | | | 1 0 | | | | | 0 1 | | | 1 0 | | | | 2 2 | | | | | | | | | | | | 6 | 2 | 4 | 33.3 | 2 | 44 |
| 45 Ludwig-Maximilians Universität, München | 7 1 | | | | | | 1 0 | | | | | | 0 1 | | | | | | 3 4 | | | | | | | | | | | | 11 | 5 | 6 | 54.5 | 4 | 45 |
| 46 Universität Rostock | | | | | | | | | | | | | | | | | | | 0 2 | | | | | | | | | | | | 2 | 0 | 2 | 100 | 1 | 46 |
| 47 Kaiser-Wilhelms-Universität, Strassburg | | | | | | | | | | | | | | | | | | | 0 1 | | | | | | | | | | | | 1 | 0 | 1 | 100 | 1 | 47 |
| 48 Eberhard-Karls-Universität, Tübingen | | | | | | | | | | | | | | | | | 1 0 | | 2 1 | | | | | | | | | | | | 3 | 1 | 2 | 66.7 | 2 | 48 |
| 49 Universität Wien | | | | | | | | | | | | | | | | | | | 1 0 | | | | | | | | | | | | 1 | 1 | 0 | 0 | 1 | 49 |
| 50 Julius-Maximilians Universität, Würzburg | | | | | | | | | | | | | | | | | | | 1 0 | | | | | | | | | | | | 1 | 1 | 0 | 0 | 1 | 50 |
| **GREECE** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 51 National University of Athens | | | | | | | 1 1 | | | | | | | 0 2 | | | | | 2 1 | | | | | | | | | | | | 1 0 | | 8 | 4 | 4 | 50 | 4 | 51 |

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practice require a certificate from the state board of examiners in the basic sciences. In

TABLE 31.--*Physicians Examined on the basis of Credentials Obtained in Countries Other Than the United States and Canada, 1930-1947*

| | Number Examined | Passed | Percentage Failed |
|---|---|---|---|
| 1930 | 167 | 92 | 44.9 |
| 1931 | 158 | 91 | 42.4 |
| 1932 | 182 | 96 | 47.3 |
| 1933 | 200 | 129 | 35.5 |
| 1934 | 285 | 170 | 40.2 |
| 1935 | 437 | 303 | 30.7 |
| 1936 | 588 | 382 | 35.0 |
| 1937 | 920 | 637 | 30.8 |
| 1938 | 1,164 | 716 | 38.5 |
| 1939 | 1,691 | 839 | 50.4 |
| 1940 | 2,088 | 948 | 54.7 |
| 1941 | 1,717 | 698 | 59.2 |
| 1942 | 1,630 | 890 | 45.4 |
| 1943 | 1,031 | 518 | 49.8 |
| 1944 | 691 | 325 | 53.0 |
| 1945 | 475 | 209 | 56.0 |
| 1946 | 495 | 221 | 55.3 |
| 1947 | 601 | 283 | 52.9 |
| Total | 14,520 | 7,547 | 48.0 |

eighteen states, Alaska, Hawaii and Puerto Rico an internship in a hospital in the United States is a prerequisite. Additional qualifications of individual states are given in footnotes of the table. Table 30 presents figures relating to physicians examined on the basis of credentials obtained in countries other than the United States and Canada by licensing boards in 1947. The figures represent both American and foreign born physicians educated abroad. Ninety-nine faculties of medicine and three licensing corporations are represented. There were 601 persons examined by thirty boards in the United States, Alaska, Hawaii and Puerto Rico, of whom 283 passed and 318 (52.9 per cent) failed. Graduates of the University of Vienna (Austria) represented the largest group, 67, who were examined in twelve states, with a failure percentage of 56.7. Fewer than 40 of the graduates of any other school were tested.

The greatest number of these graduates examined by any one state was 387 in New York, of whom 137 passed and 250 (64.6 per cent) failed. No other state tested more than 40. Fewer than 5 were examined by sixteen states and the possessions.

Table 31 records the number of graduates of faculties of medicine abroad examined for medical licensure in the United States in eighteen years (1930-1947). In this period 14,520 were examined, of whom 7,547 passed and 48 per cent failed. The greatest number of failures occurred in 1941, when 59.2 per cent failed. At no time in this eighteen year period did fewer than 30.7 per cent fail. In 1936 the number of foreign graduates began to increase, so that in 1940 there were over three times as many tested as in 1936. Since 1940 there have been annual decreases, though the number examined in 1947 was higher than in 1946, but the annual total is still in excess of the number licensed annually prior to 1935 and before the increased migration of foreign physicians to this country from Europe.

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Virginia.....Dr. K. D. Graves, 30½ Franklin Rd., S. W., Roanoke.
Washington.....Miss Virginia Rotherspoon, Olympia.
West Virginia.....Dr. N. H. Dyer, State Capitol, Charleston 5.

*Officers of State Board of Medical Examiners Continued*

| | |
|---|---|
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| Alaska | Dr. W. M. Whitehead, Box 140, Juneau. |
| Canal Zone | Dr. M. C. Stayer, Balboa Heights. |
| Hawaii | Dr. S. E. Doolittle, 881 S. Hotel St. Honolulu 53. |
| Puerto Rico | Mr. Luis Cuerto Coll, Parada 22, Puerto Rico. |
| Puerto Rico | Mr. Luis Cuerto Coll, Parada 22, Santurce. |
| Virgin Islands | Dr. J. S. Moorehead, Charlotte Amalie. |

## BOARDS OF EXAMINERS IN THE BASIC SCIENCES

Seventeen states, the District of Columbia and Alaska have adopted by legislative action basic science requirements underlying the practice of the healing art. A basic science law provides for the establishment of a board of examiners and requires that each person who desires to practice the healing arts appear before the board and demonstrate his knowledge of the basic sciences. The basic science boards have no licensing powers. A certificate in the basic sciences is a prerequisite to licensure.

TABLE 32.--*States Having Basic Science Laws and Year of Enactment*

| | | | |
|---|---|---|---|
| Alaska | 1946 | Nebraska | 1927 |
| Arizona | 1936 | New Mexico | 1941 |
| Arkansas | 1929 | Oklahoma | 1937 |
| Colorado | 1937 | Oregon | 1933 |
| Connecticut | 1925 | Rhode Island | 1940 |
| District of Columbia | 1929 | South Dakota | 1939 |
| Florida | 1939 | Tennessee | 1943 |
| Iowa | 1935 | Washington | 1927 |
| Michigan | 1937 | Wisconsin | 1925 |
| Minnesota | 1927 | | |

Connecticut and Wisconsin were the first states to adopt basic science legislation. Laws were passed in these two states in 1925. Alaska was added to the group in 1946. No legislation creating a basic science law was enacted during 1947. The states, and the year of enactment of their basic science law, are recorded in table 32.

The subjects in which examinations are conducted are shown in table 33. These subjects are specified by statute.

The examining boards have no authority to add any subjects or to refrain from examining in any subject, although the laws in some instances provide for certification without examination by the endorsement of a basic science certificate issued in another state, the examinations of the National Board of Medical Examiners or the acceptance of successful examinations in the required subjects by a licensing board. On the basis of a law passed in South Dakota in 1947 medical officers may use their military record as the basis for certification. All nineteen boards examine in anatomy, pathology and physiology, seventeen examine in chemistry, fifteen in bacteriology, nine in hygiene, two in diagnosis and one in public health.

The results of examinations held and the number of certificates issued on the basis of reciprocity or endorsement during 1947 are presented in tables 34 and 35 as reported by the respective boards. A candidate in applying for a basic science certificate is not required by law to mention his school of practice. However, by checking the biographic records of physicians and medical students on file in the office of the American Medical Association and various directories it has been possible to determine the profession of the majority of candidates. Thus it has been possible to tabulate the figures in four groups, namely, physicians and medical students, osteopaths, chiropractors and unclassified applicants. The last category includes

TABLE 33.--*Subjects Included in Basic Science Examinations*

| | Examinations Required in | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Anatomy | Bacteriology | Chemistry | Diagnosis | Hygiene | Pathology | Physiology | Public Health |
| Alaska | x | x | x | .. | x | x | x | .. |
| Arizona | x | x | x | .. | x | x | x | .. |
| Arkansas | x | x | x | .. | .. | x | x | .. |
| Colorado | x | x | x | .. | x | x | x | .. |
| Connecticut | x | .. | .. | x | x | x | x | .. |
| Dist. Columbia | x | x | x | .. | .. | x | x | .. |
| Florida | x | x | x | .. | .. | x | x | .. |
| Iowa | x | x | x | .. | x | x | x | .. |
| Michigan | x | x | x | .. | x | x | x | x |
| Minnesota | x | x | x | .. | x | x | x | .. |
| Nebraska | x | x | x | .. | x | x | x | .. |
| New Mexico | x | x | x | .. | .. | x | x | .. |
| Oklahoma | x | x | x | .. | x | x | x | .. |
| Oregon | x | .. | x | .. | x | x | x | .. |
| Rhode Island | x | x | x | .. | .. | x | x | .. |
| South Dakota | x | x | x | .. | .. | x | x | .. |
| Tennessee | x | x | x | .. | .. | x | x | .. |
| Washington | x | .. | .. | .. | .. | x | x | .. |
| Wisconsin | x | .. | .. | .. | .. | x | x | .. |

those for whom it was not possible to determine the profession represented. In Rhode Island doctors of dentistry and in Connecticut naturopaths are included in the unclassified group. It is probable that others in this unclassified group include osteopaths, chiropractors and also naturopaths who have not been identified by the reference material available.

There were 3,615 candidates examined by the nineteen boards in operation in 1947. The numbers examined in the various groups and the total examined by each board are shown in table 34. The majority (3,132) represented physicians or medical students, 147 were osteopaths, 61 chiropractors and 198 were placed in the unclassified group. Of all applicants 27.1 per cent failed. Of the physicians and medical students 23.2 per cent failed, osteopaths 34 per cent, chiropractors 68.9 per cent and unclassified 43.4 per cent. Among those who passed there were 2,405 physicians and medical students, 97 osteopaths, 19 chiropractors and 112 unclassified candidates. The basic science boards of Iowa and Florida examined the greatest number of applicants. Iowa examined 539 and Florida 512. Michigan and Minnesota tested more than 300 and Colorado, Oregon, Washington and Wisconsin more than 200. Alaska was the one board that reported no failures. The percentage of failures for physicians and medical students seems rather high, particularly when compared with the extent of failures before the state medical examining boards of the respective states.

Osteopaths were tested in Arizona, Arkansas, Colorado, Connecticut, Florida, Iowa, Michigan, Minnesota, New Mexico, Oregon, Rhode Island, Tennessee, Washington and Wisconsin. Chiropractors appeared for certification before the boards of Arizona, Connecticut, Florida, Iowa, Michigan, Minnesota, South Dakota, Washington and Wisconsin.

It is the policy of the Arizona and Minnesota boards in reporting results of its examinations to omit the names of applicants who fail examinations. The number who fail are therefore recorded only in the total column.

Fourteen boards issued 960 certificates by reciprocity, endorsement, waiver or exemption. The number of successful applicants (3,593) registered by examination and by endorsement

TABLE 34.—*Applicants Examined in Basic Sciences, 1947*

| | Physicians & Medical Studs. | | Osteopaths | | Chiropractors | | Unclassified | | Total Examined | Passed | Failed | Percentage Failed |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | P | F | P | F | P | F | P | F | | | | |
| Alaska | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 3 | 0 | 0.0 |
| Arizona | 44 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 66 | 46 | 20* | 30.3 |
| Arkansas | 83 | 5 | 1 | 1 | 0 | 0 | 0 | 0 | 90 | 84 | 6 | 6.7 |
| Colorado | 168 | 21 | 6 | 0 | 0 | 0 | 5 | 1 | 201 | 179 | 22 | 10.9 |
| Connecticut | 161 | 4 | 2 | 3 | 1 | 5 | 2 | 0 | 178 | 166 | 12 | 6.7 |
| District of Columbia | 22 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 26 | 22 | 4 | 15.4 |
| Florida | 324 | 121 | 9 | 7 | 0 | 3 | 32 | 16 | 512 | 365 | 147 | 28.7 |
| Iowa | 157 | 249 | 37 | 22 | 2 | 5 | 19 | 48 | 539 | 215 | 324 | 60.0 |
| Michigan | 266 | 113 | 2 | 3 | 1 | 0 | 5 | 5 | 395 | 274 | 121 | 30.6 |
| Minnesota | 291 | 0 | 21 | 0 | 1 | 0 | 4 | 0 | 374 | 317 | 57* | 15.2 |
| Nebraska | 83 | 24 | 0 | 0 | 0 | 0 | 0 | 1 | 108 | 83 | 25 | 23.1 |
| New Mexico | 49 | 14 | 11 | 0 | 0 | 0 | 2 | 0 | 76 | 62 | 14 | 18.4 |
| Oklahoma | 35 | 14 | 0 | 0 | 0 | 0 | 0 | 0 | 49 | 35 | 14 | 28.6 |
| Oregon | 147 | 72 | 3 | 3 | 0 | 0 | 1 | 5 | 231 | 151 | 80 | 34.6 |
| Rhode Island | 35 | 2 | 0 | 2 | 0 | 0 | 18 | 1 | 58 | 53 | 5 | 8.6 |
| South Dakota | 21 | 8 | 0 | 0 | 0 | 3 | 5 | 6 | 43 | 26 | 17 | 39.5 |
| Tennessee | 135 | 29 | 0 | 2 | 0 | 0 | 19 | 0 | 185 | 154 | 31 | 16.8 |
| Washington | 213 | 13 | 3 | 5 | 1 | 5 | 0 | 0 | 240 | 217 | 23 | 9.5 |
| Wisconsin | 168 | 34 | 1 | 2 | 12 | 21 | 0 | 3 | 241 | 181 | 60 | 24.8 |
| TOTAL-Examined | 3,132 | | 147 | | 61 | | 198 | | 3,615 | | | |
| Totals - Passed | 2,405 | | 97 | | 19 | | 112 | | | 2,633 | | |
| Totals - Failed | 727 | | 50 | | 42 | | 86 | | | | 982 | |
| Percentage Failed | 23.2 | | 34.0 | | 68.9 | | 43.4 | | | | | 27.1 |

*Nature of practice undeterminable, since names of failures not supplied.

TABLE 35.--*Basic Science Certificates Issued by Examination, Reciprocity and Endorsement, 1947*

| | Examination | | | | | Reciprocity Endorsement or Waiver | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Physicians & Medical Studs. | Osteopaths | Chiropractors | Unclassified | Totals | Physicians & Medical Studs. | Osteopaths | Chiropractors | Unclassified | Totals | Registered |
| Alaska | 3 | 0 | 0 | 0 | 3 | 17 | 0 | 0 | 0 | 17 | 20 |
| Arizona | 44 | 1 | 1 | 0 | 46 | 107 | 92 | 5 | 16 | 220 | 266 |
| Arkansas | 83 | 1 | 0 | 0 | 84 | 26 | 4 | 0 | 0 | 30 | 114 |
| Colorado | 168 | 6 | 0 | 5 | 179 | 56 | 13 | 5 | 2 | 76 | 255 |
| Connecticut | 161 | 2 | 1 | 2 | 166 | 0 | 0 | 0 | 0 | 0 | 166 |
| District of Columbia | 22 | 0 | 0 | 0 | 22 | 8 | 0 | 0 | 0 | 8 | 30 |
| Florida | 324 | 9 | 0 | 32 | 365 | 0 | 0 | 0 | 0 | 0 | 365 |
| Iowa | 157 | 37 | 2 | 19 | 215 | 0 | 0 | 0 | 0 | 0 | 215 |
| Michigan | 266 | 2 | 1 | 5 | 274 | 41 | 10 | 1 | 3 | 55 | 329 |
| Minnesota | 291 | 21 | 1 | 4 | 317 | 120 | 0 | 0 | 2 | 122 | 439 |
| Nebraska | 83 | 0 | 0 | 0 | 83 | 2 | 0 | 0 | 0 | 2 | 85 |
| New Mexico | 49 | 11 | 0 | 2 | 62 | 0 | 0 | 0 | 0 | 0 | 62 |
| Oklahoma | 35 | 0 | 0 | 0 | 35 | 1 | 0 | 0 | 0 | 1 | 36 |
| Oregon | 147 | 3 | 0 | 1 | 151 | 65 | 10 | 0 | 7 | 65 | 216 |
| Rhode Island | 35 | 0 | 0 | 18 | 53 | 7 | 0 | 0 | 0 | 7 | 60 |
| South Dakota | 21 | 0 | 0 | 5 | 26 | 52 | 2 | 1 | 9 | 64 | 90 |
| Tennessee | 135 | 0 | 0 | 19 | 154 | 114 | 0 | 0 | 0 | 114 | 268 |
| Washington | 213 | 3 | 1 | 0 | 217 | 0 | 0 | 0 | 0 | 0 | 217 |
| Wisconsin | 168 | 1 | 12 | 0 | 181 | 172 | 6 | 1 | 0 | 179 | 360 |
| Totals | 2,405 | 97 | 19 | 112 | 2,633 | 771 | 137 | 13 | 39 | 960 | 3,593 |

are recorded in table 35. Included in the total certified were 3,176 physicians, 234 osteopaths, 32 chiropractors and 151 unclassified persons. All but five boards certified candidates without examination, the greatest number so certified occurred in Arizona.

The results demonstrate that, in general, practitioners other than regular physicians are poorly equipped in the fundamentals of medicine and should not be entrusted to care for the health of the people.

Efforts are being made by the American

TABLE 36.—*Total Candidates for Basic Science Certification, 1927-1947*

| | No. of Boards | Physicians and Medical Students | | | | | | Other Practitioners | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Examined | Passed | Failed | Percentage Failed | Endorsement | Total Certified | Examined | Passed | Failed | Percentage Failed | Endorsement | Total Certified |
| 1927 | 5 | 305 | 279 | 26 | 8.5 | 26 | 305 | 22 | 15 | 7 | 31.8 | 1 | 16 |
| 1928 | 5 | 646 | 586 | 60 | 9.3 | 19 | 605 | 59 | 31 | 28 | 47.5 | 0 | 31 |
| 1929 | 7 | 668 | 610 | 58 | 8.7 | 75 | 685 | 66 | 31 | 35 | 53.0 | 0 | 31 |
| 1930 | 7 | 685 | 606 | 79 | 11.5 | 118 | 724 | 78 | 30 | 48 | 61.5 | 6 | 36 |
| 1931 | 7 | 680 | 586 | 94 | 13.8 | 141 | 727 | 107 | 48 | 59 | 55.1 | 0 | 48 |
| 1932 | 7 | 657 | 590 | 67 | 10.2 | 106 | 696 | 78 | 44 | 34 | 43.6 | 12 | 56 |
| 1933 | 8 | 601 | 527 | 74 | 12.3 | 121 | 648 | 60 | 30 | 30 | 50.0 | 10 | 40 |
| 1934 | 9 | 815 | 725 | 90 | 11.0 | 127 | 852 | 51 | 26 | 25 | 49.0 | 11 | 37 |
| 1935 | 10 | 882 | 761 | 121 | 13.7 | 110 | 871 | 74 | 33 | 41 | 55.4 | 4 | 37 |
| 1936 | 10 | 1,032 | 891 | 141 | 13.7 | 230 | 1,121 | 66 | 26 | 40 | 60.6 | 13 | 39 |
| 1937 | 12 | 1,231 | 1,061 | 170 | 13.8 | 192 | 1,253 | 113 | 41 | 72 | 63.7 | 10 | 51 |
| 1938 | 12 | 1,148 | 1,026 | 142 | 12.2 | 267 | 1,293 | 158 | 70 | 88 | 55.7 | 26 | 96 |
| 1939 | 14 | 1,141 | 1,013 | 128 | 11.2 | 727 | 1,740 | 218 | 97 | 121 | 55.5 | 294 | 391 |
| 1940 | 16 | 1,393 | 1,140 | 163 | 12.5 | 324 | 1,464 | 280 | 153 | 127 | 43.9 | 22 | 175 |
| 1941 | 17 | 1,768 | 1,560 | 208 | 11.8 | 280 | 1,840 | 356 | 191 | 165 | 46.3 | 73 | 266 |
| 1942 | 17 | 1,725 | 1,476 | 249 | 14.4 | 213 | 1,689 | 497 | 249 | 248 | 49.9 | 91 | 340 |
| 1943 | 18 | 2,330 | 2,098 | 232 | 10.0 | 296 | 2,394 | 389 | 211 | 178 | 45.8 | 86 | 297 |
| 1944 | 18 | 2,284 | 1,868 | 416 | 18.2 | 222 | 2,090 | 465 | 276 | 189 | 40.6 | 87 | 363 |
| 1945 | 18 | 2,576 | 2,146 | 430 | 16.6 | 412 | 2,558 | 397 | 193 | 204 | 51.4 | 172 | 365 |
| 1946 | 19 | 2,937 | 2,391 | 546 | 18.7 | 1,308 | 3,699 | 313 | 167 | 146 | 46.6 | 164 | 333 |
| 1947 | 19 | 3,132 | 2,405 | 727 | 23.2 | 771 | 3,176 | 406 | 228 | 178 | 43.8 | 189 | 417 |
| Totals | | 28,566 | 24,345 | 4,221 | 14.7 | 6,085 | 30,430 | 4,253 | 2,190 | 2,063 | 48.4 | 1,271 | 3,461 |

In table 36 is included the number of candidates examined and certified by basic science boards for each year since and including 1927. In 1927, when five boards were functioning, there were 305 physicians examined, of whom 8.5 per cent failed and 22 other practitioners, of whom 31.8 per cent failed. By comparison in 1947 the nineteen boards in operation examined 3,132 physicians, of whom 23.2 per cent failed and 406 other practitioners, with 43.8 per cent failures.

In the twenty-one year period 28,566 physicians and medical students were examined, of whom 24,345 were successful in these examinations. In the same period 4,253 other practitioners were tested and 2,190 were successful. Of the physicians and medical students examined in twenty-one years, 14.7 per cent failed and 48.4 per cent of the other practitioners were unsuccessful. There were in this same period 6,085 physicians and 1,271 others certified without examination.

The principle of basic science legislation is to provide a means of insuring that all who seek licensure to care for sick and injured persons shall first possess a reasonable knowledge of the sciences fundamental to the healing art. The enforcement of such laws affects mostly the group classified as "other practitioners". This is particularly significant when one takes into account that the testing of individuals for basic science registration is made by nonmedical examiners.

Association of Basic Science Boards to provide information based on experience to states contemplating new basic science board legislation and to develop procedures to facilitate reciprocity arrangements. In some instances basic science certification by reciprocity is unnecessarily difficult because of otherwise unimportant differences in the laws of the various states. An analysis of basic science laws was presented by Dr. Walter L. Bierring, secretary of the Federation of State Medical Boards of the United States, before the February 1948 Annual Congress on Medical Education and Licensure.[3] In summarizing his remarks, Dr. Bierring commented on improvements that might be made in existing legislation which would produce even more effective results than are presented in the preceding paragraphs while at the same time they would facilitate the interchange of practicing physicians and relieve much of the conflict that now exists.

The present executive officer of each of the nineteen basic science boards is as follows:

OFFICIALS OF BASIC SCIENCE BOARDS

Arizona—Mr. Francis A. Roy, Science Hall, University of Arizona, Tucson.

Arkansas—Mr. L. E. Gebauer, 701 Main Street, Little Rock.

Colorado—Esther B. Starks, D. O., 1439 Ogden Street, Denver.

Connecticut—Mr. C. M. Bakewell, 250 Church Street, New Haven.

District of Columbia—Dr. G. C. Rubland, 6012 E. Municipal Building, Washington.

3. Federation Bulletin (March) 1948, to be published.

Florida—Dr. M. W. Emnell, University of Florida, Gainesville.
Iowa—Dr. Ben H. Peterson, Coe College, Cedar Rapids.
Michigan—Miss Eloise LeBeau, 101 N. Walnut Street, Lansing.
Minnesota—Dr. Raymond N. Bieter, 105 Millard Hall, University of Minnesota, Minneapolis 14.
Nebraska—Mr. Oscar F. Humble, 1009 State Capitol Building, Lincoln 9.
New Mexico—Miss Marion M. Rhea, 114 E. Marcy St., Santa Fe.
Oklahoma—Dr. Frank C. Gallagher, 813 Braniff Bldg., Oklahoma City.
Oregon—Dr. C. D. Byrne, University of Oregon, Eugene.
Rhode Island—Mr. Thomas B. Casey, 366 State Office Building, Providence.
South Dakota—Dr. G. M. Evans, Yankton.
Tennessee—Dr. O. W. Hyman, 874 Union Avenue, Memphis.
Washington—Mr. Harry C. Huse, Olympia.
Wisconsin—Mr. William H. Barber, Watson and Scott Sts., Ripon.
Alaska—Dr. C. Earl Albrecht, Box 1931, Juneau, Alaska.

### NATIONAL BOARD OF MEDICAL EXAMINERS

The medical licensing boards of forty-five states, the District of Columbia, Alaska, Hawaii, Puerto Rico and the Canal Zone recognize the certificate of the National Board of Medical Examiners as an adequate qualification for a medical license. During 1945 legislation was enacted in Indiana permitting licensure without examination of National Board diplomates. In 1945 Nevada temporarily suspended acceptance of the National Board certificate, but recognition was restored in 1947. Louisiana exempts diplomates from the state examinif they have been licensed in some other state with which Louisana reciprocates. The provisions of the medical practice laws or state regulations of the following states are such that diplomates of the National Board are required to take an oral examination: Illinois, Maine, Rhode Island, South Carolina and Wyoming. A brief supplemental written examination is required in Michigan. The National Board's certificate is not recog-

TABLE 37.—*States Endorsing Certificates of the National Board of Medical Examiners*

| | | | |
|---|---|---|---|
| Alabama | Illinois[1] | Nebraska | Puerto Rico[1] |
| Alaska | Indiana | Nevada | Rhode Island |
| Arizona | Iowa | New Hampshire | South Carolina |
| Arkansas | Kansas | New Jersey | South Dakota |
| California | Kentucky | New Mexico | Tennessee |
| Canal Zone | Louisiana | New York | Texas |
| Colorado | Maine[1] | North Carolina | Utah |
| Connecticut | Maryland | North Dakota | Vermont |
| Delaware | Massachusetts | Ohio | Virginia |
| Dist. of Columbia | Michigan[2] | Oklahoma | Washington |
| Georgia | Minnesota | Oregon | West Virginia |
| Hawaii | Mississippi | Pennsylvania | Wyoming[1] |
| Idaho | Missouri | | |

1. Oral examination required.
2. Brief supplemental written examination required.

nized by the licensing authorities of Florida, Montana and Wisconsin. The states, territories and possessions of the United States endorsing the certificate of the National Board are listed in table 37.

The examinations of the National Board in the basic sciences are accepted in lieu of the examination in these subjects given by the basic science board of Connecticut, Iowa, Minnesota, Nebraska, Oklahoma, Tennessee and the District of Columbia.

Diplomates are admitted to the final examination of the Examining Board in England, of the Triple Qualification Board of Scotland and of the Conjoint Board in Ireland. Physicians holding the certificate of one of these licensing corporations desiring registration by the National Board are exempt from part I of its examination.

Diplomates are exempt from some of the qualifications required of the United States Public Health Service and the Mayo Foundation for Medical Education and Research.

The National Board was founded in 1915 and and the first examination for certification was given in October 1915. From that date and up to and including a test held in June 1921, eleven examinations were given and 298 candidates were certified. The results of the examinations given during this period are given in table 39.

TABLE 38.—*National Board Examinations, 1916-1921*

| Date | | Total Examined | Failed | Percentage Failed |
|---|---|---|---|---|
| October | 1916 | 10 | 5 | 50.0 |
| June | 1917 | 12 | 3 | 25.0 |
| October | 1917 | 28 | 6 | 21.4 |
| January | 1918 | 20 | 2 | 10.0 |
| April | 1918 | 23 | 5 | 21.7 |
| December | 1918 | 16 | 1 | 6.3 |
| June | 1919 | 52 | 1 | 1.9 |
| February | 1920 | 48 | 12 | 25.0 |
| May | 1920 | 60 | 14 | 23.3 |
| February | 1921 | 16 | 5 | 31.3 |
| June | 1921 | 40 | 3 | 7.5 |
| Totals | | 325 | 57 | 17.5 |

Since 1922 the examination has been given in three parts as follows: part I, a written examination in the basic sciences; part II, a written examination in five major clinical subjects and part III, a clinical and practical examination in six major clinical divisions and their component subjects or subdivisions. Parts I and II are given in approved medical schools throughout the country, while part III is given under the direction of local subsidiary boards in twenty-four centers at times sufficiently frequent to accommodate all eligible candidates.

Students of medical schools in the United States and Canada approved by the Council on Medical Education and Hospitals of the American Medical Association are admitted to the examinations of the National Board. In addition, graduates of the university medical schools of Great Britain and Ireland are accepted provided these graduates have been licensed to practice in the country in which the school attended is located.

The board's examinations are also accepted by many medical schools as part of their own examination and promotion procedure. At some of the schools the students are required to pass part I at the end of the second year and part II at the end of the fourth year. Other schools require that part II be passed at the end of the fourth year. Candidates who fail to to pass the National Board examinations are given a supplemental examination at most schools. The schools that require their stu-

V 1
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dents to take the National Board's examinations under one plan or another are Albany, Boston University, Buffalo, Duke, Emory, Georgetown, George Washington, Harvard, Long Island, New York Medical College, Ohio State, Syracuse, Tufts and Yale. In addition to the schools named there are a few others at which those students who voluntarily take and pass the National Board's examinations, either in part I or in part II, are excused from the corresponding final school examinations. This group of schools includes Colorado, Illinois, Loyola, Minnesota, Pennsylvania, Tulane and and the Woman's Medical College. The National Board believes that such use of its examinations is of definite value to the board because it necessitates that the examination be kept in close step with present medical education in this country. It appreciates the responsibility that this places on its examinations as well as the confidence which the schools are placing in the fairness and quality of its examinations.

The balance of the tables enumerate the results of examinations given in parts I, II and III during 1947 and for each calendar year since 1922, including those who passed and failed examinations and those who were certified.

A candidate is eligible for part I who has met the premedical requirements and has completed successfully the first two years of

TABLE 39.—*National Board Examinations in Part I, 1922-1947*

| Date | Total Examinations | Passed | Incomplete | Failed | Percentage Failed |
|---|---|---|---|---|---|
| March 1947 | 720 | 451 | 201 | 75 | 16.6 |
| June 1947 | 1,580 | 760 | 695 | 125 | 16.5 |
| September 1947 | 1,278 | 633 | 545 | 100 | 15.3 |
| Totals | 3,514 | 1,844 | 1,352 | 318 | 14.7 |
| 1922 | 209 | 113 | 59 | 47 | 29.3 |
| 1923 | 207 | 130 | 77 | 31 | 19.3 |
| 1924 | 591 | 415 | 69 | 107 | 20.5 |
| 1925 | 608 | 400 | 59 | 150 | 26.3 |
| 1926 | 635 | 435 | 104 | 96 | 15.3 |
| 1927 | 702 | 452 | 159 | 91 | 16.8 |
| 1928 | 963 | 533 | 231 | 79 | 12.9 |
| 1929 | 1,995 | 975 | 931 | 98 | 11.8 |
| 1930 | 1,249 | 991 | 945 | 114 | 12.5 |
| 1931 | 1,277 | 755 | 425 | 97 | 11.4 |
| 1932 | 1,307 | 967 | 371 | 69 | 9.3 |
| 1933 | 1,234 | 702 | 319 | 136 | 16.0 |
| 1934 | 1,241 | 899 | 367 | 85 | 9.5 |
| 1935 | 1,256 | 785 | 430 | 69 | 8.1 |
| 1936 | 1,344 | 950 | 363 | 123 | 12.5 |
| 1937 | 1,315 | 971 | 315 | 149 | 14.5 |
| 1938 | 1,554 | 995 | 580 | 159 | 14.0 |
| 1939 | 1,733 | 1,048 | 450 | 225 | 17.7 |
| 1940 | 1,683 | 1,069 | 375 | 209 | 16.4 |
| 1941 | 1,680 | 1,097 | 496 | 187 | 15.0 |
| 1942 | 1,857 | 1,304 | 471 | 192 | 13.0 |
| 1943 | 2,554 | 1,441 | 952 | 253 | 14.9 |
| 1944 | 3,270 | 2,325 | 1,495 | 450 | 15.9 |
| 1945 | 3,855 | 2,705 | 1,475 | 384 | 11.9 |
| 1946 | 3,168 | 1,595 | 1,189 | 394 | 13.5 |
| 1947 | 3,514 | 1,844 | 1,352 | 318 | 14.7 |
| Totals | 41,680 | 26,835 | 12,574 | 4,270 | 14.3 |

work in an approved medical school. An incomplete examination is allowed candidates taking part I at the end of their second medical year in schools whose third year curriculums include courses in one or two subjects of this part. The examinations in the subjects not yet completed are therefore postponed and and may be taken at any examination period after the candidate has completed them in his medical school. They are recorded in these statistics under the heading "Incomplete Examinations" and are excluded from the calculations referring to the percentage of failures. Any candidate not entitled to take an incomplete examination in part I may, if he so elects, take a divided examination by writing any four subjects at one time and the remaining two within thirteen months.

A candidate is eligible for part II who has passed part I and has completed successfully a four year medical course in an approved medical school.

TABLE 40.—*National Board Examinations in Part II, 1922-1947*

| Date | Total Examinations | Passed | Incomplete | Failed | Percentage Failed |
|---|---|---|---|---|---|
| March 1947 | 576 | 566 | 0 | 10 | 1.7 |
| April 1947 | 654 | 645 | 0 | 9 | 1.3 |
| June 1947 | 315 | 311 | 0 | 4 | 1.2 |
| September 1947 | 96 | 91 | 0 | 5 | 5.2 |
| Totals | 1,641 | 1,613 | 0 | 28 | 1.7 |
| 1922 | 109 | 90 | 0 | 19 | 17.4 |
| 1923 | 192 | 170 | 2 | 20 | 10.5 |
| 1924 | 267 | 227 | 0 | 40 | 15.0 |
| 1925 | 362 | 309 | 0 | 53 | 9.8 |
| 1926 | 381 | 334 | 1 | 46 | 12.1 |
| 1927 | 361 | 316 | 1 | 44 | 12.2 |
| 1928 | 410 | 371 | 1 | 38 | 9.3 |
| 1929 | 485 | 399 | 19 | 67 | 10.5 |
| 1930 | 620 | 543 | 7 | 70 | 11.4 |
| 1931 | 719 | 630 | 2 | 87 | 12.1 |
| 1932 | 732 | 674 | 0 | 58 | 7.9 |
| 1933 | 716 | 653 | 0 | 63 | 8.8 |
| 1934 | 768 | 716 | 2 | 50 | 6.5 |
| 1935 | 855 | 803 | 1 | 51 | 6.0 |
| 1936 | 961 | 915 | 0 | 46 | 5.3 |
| 1937 | 930 | 884 | 0 | 46 | 5.0 |
| 1938 | 1,029 | 983 | 0 | 56 | 5.5 |
| 1939 | 1,041 | 994 | 1 | 46 | 4.6 |
| 1940 | 1,072 | 1,031 | 0 | 41 | 3.8 |
| 1941 | 1,061 | 1,005 | 0 | 56 | 5.0 |
| 1942 | 1,085 | 1,050 | 0 | 35 | 3.2 |
| 1943 | 1,599 | 1,565 | 0 | 34 | 2.1 |
| 1944 | 1,824 | 1,781 | 0 | 43 | 2.4 |
| 1945 | 1,641 | 1,613 | 0 | 28 | 1.7 |
| 1946 | 1,641 | 1,613 | 0 | 28 | 1.7 |
| 1947 | 21,487 | 20,195 | 46 | 1,246 | 5.8 |

A candidate is eligible for part III who has passed parts I and II, is in possession of the M.D. degree and has satisfactorily completed a one year internship in a hospital approved for such training by the American Medical Association or by the Canadian Medical Association, or has served in a laboratory acceptable to the National Board.

Three examinations were given in part I in 1947 and four in part II, while tests in part III were held at various times during the year.

Tables 39 and 40 record the results of examinations given in parts I and II and include candidates who fail and are reexamined during the same year and those who pass parts I and II in the same year. Thus the figures shown represent examinations conducted rather than individuals examined.

During the year 1947, 3,514 examinations were given in part I; 1,844 passed and 318, or 14.7 per cent, failed. There were 1,352 incomplete examinations given. In calculating the percentage of failures the incomplete examination figures are excluded. In part II, 1,641 examinations were held; 1,613 passed and 28, or 1.7 per cent, failed. Incomplete examinations are seldom given in part II. There were none given in 1947.

Since 1922 a total of 41,680 examinations have been given in part I and 21,487 in part

II. During this period 24,836 passed part I and 20,195 passed part II. In twenty-six years there have been 4,170 failures in part I, 14.3 per cent, and 1,246, 5.8 per cent, in part II. The increasing acceptance by medical schools of the National Board's examinations as well as the increase in the number of students in medical schools as a result of the accelerated program which is still in effect in several schools is reflected in the totals for Part I and II of the board's examinations since 1942. The greatest number of examinations were given in part I in 1944, and in part II in 1943.

TABLE 41.--*Parts I, II and III, Excluding Duplications, 1922-1947*

| Date | Total Examinations | Passed | Incomplete | Failed | Percentage Failed |
|---|---|---|---|---|---|
| 1922 | 525 | 381 | 58 | 86 | 16.4 |
| 1923 | 775 | 594 | 79 | 102 | 14.7 |
| 1924 | 978 | 756 | 69 | 153 | 16.9 |
| 1925 | 1,147 | 915 | 50 | 292 | 10.1 |
| 1926 | 1,151 | 930 | 195 | 126 | 11.0 |
| 1927 | 1,248 | 947 | 142 | 159 | 14.4 |
| 1928 | 1,430 | 1,101 | 211 | 118 | 9.7 |
| 1929 | 1,723 | 1,280 | 319 | 124 | 8.9 |
| 1930 | 2,044 | 1,547 | 322 | 175 | 10.2 |
| 1931 | 2,218 | 1,632 | 419 | 176 | 9.7 |
| 1932 | 2,342 | 1,850 | 355 | 137 | 8.9 |
| 1933 | 2,277 | 1,896 | 290 | 191 | 9.5 |
| 1934 | 2,261 | 1,891 | 339 | 139 | 6.7 |
| 1935 | 2,364 | 1,831 | 404 | 129 | 6.6 |
| 1936 | 2,517 | 1,989 | 353 | 175 | 9.1 |
| 1937 | 2,735 | 2,151 | 397 | 187 | 8.9 |
| 1938 | 2,992 | 2,398 | 493 | 193 | 7.5 |
| 1939 | 3,221 | 2,675 | 443 | 392 | 10.9 |
| 1940 | 3,188 | 2,597 | 343 | 229 | 9.1 |
| 1941 | 3,319 | 2,749 | 332 | 237 | 7.9 |
| 1942 | 3,607 | 3,014 | 391 | 202 | 6.3 |
| 1943 | 4,516 | 3,971 | 405 | 237 | 6.1 |
| 1944 | 5,363 | 4,235 | 750 | 368 | 8.0 |
| 1945 | 5,514 | 4,698 | 886 | 260 | 5.5 |
| 1946 | 5,912 | 4,730 | 888 | 294 | 5.7 |
| 1947 | 6,249 | 4,955 | 1,002 | 292 | 5.3 |
| Totals | 71,747 | 56,724 | 10,061 | 4,962 | 8.0 |

In 1947, 1,743 tests were given in part III; 1,725 passed and 18, 1 per cent, failed. Results of examinations in this part in twenty-six years are given in table 41 and indicate that 17,228 candidates were tested, of whom 16,793 were granted the certificate of the board. Since the inception of the National Board in 1916, 17,061 certificates have been awarded. Physicians so certified are designated as diplomates and are privileged to use in any proper manner the initials D.N.B. if they so choose. The diplomates have formed a national organization entitled "The Associated Diplomates of the National Board," which meets at the time and place of the annual meetings of the American Medical Association and the Southern Medical Association. A membership emblem in the form of a gold key has been adopted. State committees have been appointed in all states.

The figures thus far presented represent examinations given. The number of individuals tested during any one year is recorded for the twenty-six year period in table 42. The classification as "Passed" or Failed" in which more than one examination has been taken in a given year was based on the results of the last examination during the year in question. For example, if in 1947 a candidate passed part I but later in 1947 failed part II he is computed in the tabulation as having failed. On this basis figures computed indicate that there were 6,249 who took at least one of the tests of the National Board in 1947, as compared with 525 in 1922. The trend has been steadily upward. In 1947 the number of candidates was 337 greater than in the previous year. For the twenty-six year period, 71,747 individuals were examined in one or more of the annual examinations, of whom 56,724 passed, 10,061 took incomplete examinations, and 4,962, 8 per cent, failed.

The 1,725 physicians certified as diplomates last year represented sixty-two existing approved medical schools and one approved medical school now extinct in the United States, five approved schools in Canada, and eight foreign faculties of medicine (table 43). A few of the latter were graduates of the medical schools in continental Europe who had registered for the board's examinations before the limitations applied to foreign schools were put into effect.

In 1947, 2,312 diplomates were granted licenses to practice medicine on the basis of their National Board Certificate in forty-two states, the District of Columbia, Alaska, Hawaii and Puerto Rico. The number so registered by each licensing board is shown in table 44. Since the National Board was formed, 14,994 physicians have been licensed to practice medicine on the basis of their credentials from the board. In the same period 16,793 received the certificate of the board. The credential apparently was not used as a licensing medium by 1,799.

TABLE 42.--*National Board Examinations in Part III, 1922-1947*

| Date | Total Examinations | Passed | Failed | Percentage Failed |
|---|---|---|---|---|
| 1922 | 22 | 22 | 0 | 0.0 |
| 1923 | 82 | 81 | 1 | 1.2 |
| 1924 | 125 | 120 | 6 | 4.8 |
| 1925 | 219 | 206 | 13 | 5.9 |
| 1926 | 255 | 243 | 12 | 4.7 |
| 1927 | 293 | 272 | 21 | 7.2 |
| 1928 | 322 | 306 | 15 | 5.0 |
| 1929 | 352 | 337 | 15 | 4.3 |
| 1930 | 420 | 401 | 19 | 4.5 |
| 1931 | 437 | 419 | 18 | 4.1 |
| 1932 | 550 | 522 | 28 | 5.1 |
| 1933 | 551 | 526 | 25 | 4.5 |
| 1934 | 567 | 548 | 19 | 3.4 |
| 1935 | 598 | 578 | 20 | 3.3 |
| 1936 | 576 | 547 | 29 | 5.0 |
| 1937 | 668 | 630 | 38 | 5.7 |
| 1938 | 706 | 682 | 24 | 3.4 |
| 1939 | 770 | 729 | 41 | 5.3 |
| 1940 | 792 | 771 | 21 | 2.7 |
| 1941 | 910 | 885 | 25 | 2.7 |
| 1942 | 1,054 | 1,041 | 13 | 1.2 |
| 1943 | 1,230 | 1,213 | 17 | 1.4 |
| 1944 | 1,168 | 1,146 | 22 | 1.9 |
| 1945 | 1,244 | 1,231 | 13 | 1.0 |
| 1946 | 1,633 | 1,612 | 21 | 1.2 |
| 1947 | 1,743 | 1,725 | 18 | 1.0 |
| Totals | 17,289 | 16,793 | 495 | 2.8 |

In twenty-six years there have been 4,170 failures in part I, 14.3 per cent, and 1,246, 5.8 per cent, in part II. The increasing acceptance by medical schools of the National Board's examinations as well as the increase in the number of students in medical schools as a result of the accelerated program which is still in effect in several schools is reflected in the totals for Part I and II of the board's examinations since 1942. The greatest number of examinations were given in part I in 1944, and in part II in 1943.

The constitution of the National Board of Medical Examiners provides for a membership of thirty representing the federal services,

the Federation of State Medical Boards of the United States, the Association of American Medical Colleges, the Council on Medical Education and Hospitals of the American Medical Association and members elected at large. The president of the board is Porden S. Veeder, M.D., the medical secretary, J.S. Rodman, M.D., and the executive secretary and treasurer, Mr. Everett S. Elwood. The address of the board is 225 South 15th Street, Philadelphia.

TABLE 43.—*Diplomates from Individual Medical Schools, 1947*

| | |
|---|---|
| University of Arkansas | 1 |
| College of Medical Evangelists | 43 |
| Stanford University | 2 |
| University of California | 2 |
| University of Southern California | 1 |
| University of Colorado | 10 |
| Yale University | 67 |
| George Washington University | 64 |
| Georgetown University | 47 |
| Howard University | 14 |
| Emory University | 1 |
| Loyola University | 9 |
| Northwestern University | 15 |
| University of Chicago | 1 |
| University of Illinois | 5 |
| Indiana University | 13 |
| State University of Iowa | 28 |
| University of Louisville | 7 |
| Louisiana State University | 3 |
| Tulane University | 7 |
| Johns Hopkins University | 16 |
| University of Maryland | 7 |
| Boston University | 65 |
| Harvard Medical School | 143 |
| Tufts College Medical School | 117 |
| University of Michigan | 9 |
| Wayne University | 5 |
| University of Minnesota | 7 |
| St. Louis University | 16 |
| Washington University | 8 |
| Creighton University | 14 |
| University of Nebraska | 9 |
| Albany Medical College | 48 |
| Columbia University | 123 |
| Cornell University | 57 |
| Long Island College of Medicine | 93 |
| New York Medical College | 93 |
| New York University | 106 |
| Syracuse University | 27 |
| University of Buffalo | 82 |
| University of Rochester | 43 |
| Duke University | 66 |
| Bowman - Gray School of Medicine | 1 |
| University of Cincinnati | 3 |
| Western Reserve University | 4 |
| University of Oklahoma | 1 |
| University of Oregon | 4 |
| Hahnemann Medical College | 26 |
| Jefferson Medical College | 15 |
| Temple University | 8 |
| University of Pennsylvania | 39 |
| University of Pittsburgh | 2 |
| Woman's Medical College | 15 |
| Meharry Medical College | 23 |
| University of Tennessee | 1 |
| Vanderbilt University | 2 |
| Baylor University | 1 |
| University of Vermont | 1 |
| Medical College of Virginia | 22 |
| University of Virginia | 2 |
| Marquette University | 11 |
| University of Wisconsin | 16 |
| Laval University | 1 |
| McGill University | 1 |
| University of Manitoba | 1 |
| University of Toronto | 1 |
| University of Western Ontario | 1 |
| Extinct Medical School | 2 |
| Foreign Schools | 2 |
| Total | 11 |
| | 1,725 |

## EXAMINING BOARDS IN THE MEDICAL SPECIALTIES

Examining and certifying boards have been established in sixteen specialties. The American Board of Ophthalmolgy, the first of the examining boards in the specialties, was organized in 1917. Four additional boards were organized by 1933 (Otolaryngology in 1924, Obstetrics and Gynecology in 1930, Dermatology and Syphilology in 1932 and Pediatrics in 1933). In 1934 the Council on Medical Education and Hospitals of the American Medical Association formulated minimal standards governing specialty boards. The boards then in existence were subsequently approved as well as boards formed in later years. By 1940 fifteen approved boards were in operation. The latest specialty board was added to the group in 1947 by approval of the American Board of Physical Medicine.

TABLE 44.—*Licenses Granted on the Basis of National Board Certificates, 1947*

| | | | |
|---|---|---|---|
| Alabama | 3 | New Hampshire | 27 |
| Arizona | 9 | New Jersey | 78 |
| Arkansas | 3 | New Mexico | 4 |
| California | 244 | New York | 702 |
| Colorado | 9 | North Carolina | 63 |
| Connecticut | 114 | North Dakota | 7 |
| District of Columbia | 90 | Ohio | 55 |
| Georgia | 16 | Oklahoma | 8 |
| Idaho | 9 | Oregon | 11 |
| Illinois | 73 | Pennsylvania | 64 |
| Indiana | 12 | Rhode Island | 17 |
| Iowa | 33 | South Carolina | 10 |
| Kansas | 13 | South Dakota | 6 |
| Kentucky | 5 | Tennessee | 13 |
| Maine | 36 | Texas | 26 |
| Maryland | 47 | Vermont | 27 |
| Massachusetts | 272 | Virginia | 31 |
| Michigan | 32 | Washington | 33 |
| Minnesota | 36 | West Virginia | 8 |
| Mississippi | 2 | Wyoming | 3 |
| Missouri | 25 | Alaska | 1 |
| Nebraska | 9 | Hawaii | 8 |
| Nevada | 1 | Puerto Rico | 17 |
| Total | | | 2,312 |

Three boards certify candidates in subspecialties. The American Board of Internal Medicine certifies in allergy, cardiovascular disease, gastroenterology and pulmonary diseases. The American Board of Surgery certifies in proctology, the American Board of Pediatrics certifies in allergy. Regular board certification is a prerequisite for certification in these subspecialties. This function is also approved by the Council.

The regulations of the various boards regarding their organization, personnel, purposes and requirements for certification was published in the Educational Number of THE JOURNAL in 1947[4]. There is also included the regulations of the Advisory Board for Medical Specialties. This latter board was organized in 1933-1934 and acts in an advisory capacity to the specialty boards. It also functions in close collaboration with the Council on Medical Education and Hospitals.

A list of the approved specialty boards and their officers, the year of their incorporation and the number of certificates awarded

4. J. A. M. A. 134:1394 (Aug. 16) 1947.

TABLE 45.—*Approved Examining Boards in Medical Specialties*

| No. | Name of Board | Year of Incorporation | Total Certificates Awarded to March 1, 1947 | Total Certificates Awarded to March 1, 1948 | Total Living Diplomates March 1, 1948 |
|---|---|---|---|---|---|
| 1. | American Board of Pediatrics.....<br>Pres., Charles F. McKhann, 2365 Adelbert Road, Cleveland, Ohio.<br>Sec., Lee F. Hill, 710 Royal Union Building, Des Moines, Iowa. | 1933 | 2,572 | 2,749 | |
| 2. | American Board of Psychiatry and Neurology.....<br>Pres., John C. Whitehorn, Johns Hopkins Hospital, Baltimore, Md. Ward.<br>Sec., F. J. Braceland, 102-1B Second Ave., S.W., Rochester, Minnesota. | 1934 | 2,448 | 2,836 | 2,720 |
| 3. | American Board of Orthopedic Surgery.....<br>Pres., Guy A. Caldwell, 1503 Pyramid St., New Orleans.<br>Sec., Francis D. McSweeney, 1126 West 6th St., Los Angeles 14. | 1934 | 1,042 | 1,216 | 1,153 |
| 4. | American Board of Dermatology and Syphilology.....<br>Pres., Francis E. Senear, 55 E. Washington St., Chicago.<br>Sec., George B. Lewis, 66 E. 80th St., New York City. | 1932 | 890 | 972 | 901 |
| 5. | American Board of Radiology.....<br>Pres., E. L. Jenkinson, 2130 N. Lincoln Park, West, Chicago, Illinois.<br>Sec., H. R. Kirklin, 102-1B Second Ave., S.W., Rochester, Minnesota. | 1934 | 2,373 | 2,622 | * |
| 6. | American Board of Urology.....<br>Pres., Gilbert J. Thomas, 9421 Brighton Way, Beverly Hills, California.<br>Sec., Harry Culver, Route 13, Honeycomb Road, Minneapolis 13. | 1935 | 1,136 | 1,265 | 1,170 |
| 7. | American Board of Obstetrics and Gynecology.....<br>Pres., Walter T. Dannreuther, 130 Park Ave., New York City.<br>Sec., Paul Titus, 1015 Highland Building, Pittsburgh 6. | 1930 | 2,236 | 2,470 | 2,315 |
| 8. | American Board of Internal Medicine.....<br>Chm., William S. McCann, 260 Crittenden Blvd., Rochester, N.Y.<br>Sec.-Treas., Truman G. Schnabel, 1700 Pine St., Philadelphia.<br>Asst. Sec., William A. Sarrell, One West Penn Sq., Bellevue 2, Pennsylvania. | 1936 | 4,449 | 1,008 | * |
| 9. | American Board of Pathology.....<br>Pres., R. C. Foot, 321 E. 105th St., New York City.<br>Sec., Robert A. Moore, 807 Euclid Ave., St. Louis 10. | 1936 | 1,378 | 1,663 | 1,427 |
| 10. | American Board of Ophthalmology.....<br>Pres., Everett J. Gear, 1360 Walker Ave., Houston, Texas.<br>Sec., S. John Mauch, St. Pete Head, Cape Cottage, Maine | 1917 | 2,564 | 2,657 | 2,306 |
| 11. | American Board of Otolaryngology.....<br>Pres., H. I. Lillie, 102-1B Second Ave., S.W., Rochester, Minnesota.<br>Sec., Dean M. Lierle, University Hospitals, Iowa City. | 1924 | 3,988 | 4,085 | * |
| 12. | American Board of Surgery.....<br>Chm., Perdrau B. St. John, 1000 Park Washington Ave., New York City.<br>Sec., J. Stewart Rodman, 225 S. 15th St., Philadelphia | 1937 | 2,962 | 3,272 | * |
| 13. | American Board of Anesthesiology.....<br>Sec., Paul M. Wood, 745 Fifth Ave., New York City 22. | 1938 | 316 | 417 | 412 |
| 14. | American Board of Plastic Surgery.....<br>Chm., Jerome P. Webster, 630 W. 168th St., New York City 32.<br>Sec., Louis T. Byars, 699 Metropolitan Bldg., St. Louis. | 1937 | 171 | 175 | 154 |
| 15. | American Board of Neurological Surgery.....<br>Chm., Howard C. Naffziger, 304 Post St., San Francisco.<br>Sec., Cullen F. Gerow, 710 Howard Ave., New Haven 4, Conn. | 1940 | 101 | 220 | 226 |
| 16. | American Board of Physical Medicine..<br>Chm., Frank H. Krusen, 102-1B Second Ave., S.W., Rochester, Minnesota.<br>Sec.-Treas., R. L. Bennett, 30 N. Michigan Ave., Chicago | 1947 | .. | 86 | 0 |
| | Totals..... | | 28,496 | 31,496 | 32,756 |

Advisory Board for Medical Specialties
Pres., Rubin C. Boots, University of Pennsylvania, Philadelphia.
Sec., H. R. Kirklin, 102-1B Second Ave., Rochester, Minnesota.

TABLE 45.—*Approved Examining Boards in Medical Specialties (continued)*

| Certification in Subspecialties | Total Certificates Awarded to March 1, 1947 | Total Certificates Awarded to March 1, 1948 | Total Living Diplomates March 1, 1948 |
|---|---|---|---|
| By the American Board of Internal Medicine | | | |
| Allergy | 95 | 106 | * |
| Cardiovascular disease | 261 | 282 | * |
| Gastroenterology | 183 | 198 | * |
| Pulmonary diseases | 163 | 176 | * |
| By the American Board of Pediatrics | | | |
| Allergy | 17 | 32 | * |
| By the American Board of Surgery | | | |
| Proctology | 79 | 80 | * |
| Totals | 898 | 982 | * |

* Number deceased diplomates not available.

prior to March 1, 1947 and the number certified to March 1, 1948 respectively appear in table 45. Likewise shown in these two categories are the numbers certified in the subspecialties. A third column in this table includes the total number of living diplomates for the boards that were able to supply such figures. On March 1, 1947 there were 28,496 physicians certified by the fifteen boards in operation. During 1947 the American Board of Physical Medicine was approved and certified 86 physicians. Altogether 3,002 physicians were certified from March 1, 1947 to March 1, 1948. Up to this latter date a total of 31,498 physicians have been certified by sixteen boards. Up to March 1, 1947, 898 certificates in subspecialties were awarded and during the ensuing year 84, bringing the total in the subspecialties to 982 as of March 1, 1948.

In the specialties of internal medicine and surgery, 5,008 and 3,272, respectively, have received the certificate of these boards. These boards were organized in 1936 and 1937. Otolaryngology, organized in 1924, has certified

TABLE 46.—*Annual Specialty Board Certifications Since 1940-1948*

| Year (Ended March) | Number of Boards in Existence | Number Certified | Accumulated Totals |
|---|---|---|---|
| 1940 | 14 | ..... | 15,853 |
| 1941 | 15 | 2,085 | 17,938 |
| 1942 | 15 | 1,756 | 19,694 |
| 1943 | 15 | 2,172 | 21,866 |
| 1944 | 15 | 1,578 | 23,444 |
| 1945 | 15 | 1,308 | 24,752 |
| 1946 | 15 | 1,320 | 26,072 |
| 1947 | 15 | 2,424 | 28,496 |
| 1948 | 16 | 3,002 | 31,498 |

to date 4,085, while the oldest board in existence, ophthalmology, (organized in 1917) has certified 2,657. Internal Medicine certified the greatest number in 1947—559.

Table 46 gives the annual number of specialists certified by all boards for nine years and the accumulated totals. The largest number (3,002) obtained certificates in the period from March 1, 1947 to March 1, 1948. The figures

shown represent the total number of certificates issued and include the numbers of living specialists. Ten boards which were able to supply the number of living diplomates reported 890 deceased.

In THE JOURNAL[5] there was published a list of residencies and fellowships in the specialities which are acceptable to the American boards in fulfilment of the clinical training requirements.

Eleven boards recognize training with a qualified preceptor as a substitute for special clinical training. The policies of the boards toward the acceptance of such training are briefly outlined in table 47. The time credit that is allowed varies but in all instances is decided on an individual basis. This type of training is not accepted by five boards, although it is to be considered for acceptance by one of these boards.

During the year a liaison committee was formed consisting of representatives of the Council on Medical Education and Hospitals and the Advisory Board for Medical Specialties for the purpose of interchange of ideas and discussion of problems of mutual interest.

5. J. A. M. A. 137:42 (May 1) 1948.

TABLE 47.—*Specialty Board Credit for Preceptorship Training*

| | Credit Awarded | Preceptors Limitations: Any Certified Board Member | Preceptors Limitations: Other Than Certified Board Members | Preceptors Limitations: List of Preceptors Maintained | Maximum Clinical Training Credit |
|---|---|---|---|---|---|
| Anesthesiology | Yes | Yes[1] | Yes[1] | No | 2 years |
| Dermatology and Syphilology | Yes | Yes[1] | No | Yes | 1 year |
| Internal Medicine | No | — | — | — | — |
| Neurological Surgery | Yes | Yes[1] | Yes[1] | No | No limit set |
| Obstetrics and Gynecology | Yes | Yes | Yes[1] | No | Average 6 mos. for each year of approved preceptorship. |
| Ophthalmology | Yes | Yes | Yes | No | No limit set |
| Orthopedic Surgery | Yes | Yes | No | No | See footnote 2 |
| Otolaryngology | Yes | Yes | Yes | No | 5 years |
| Pathology | No | — | — | — | — |
| Pediatrics | No | — | — | — | — |
| Physical Medicine | Yes | Yes[1] | Yes[1] | Yes | 3 years |
| Plastic Surgery | Yes | Yes | No | Yes | Full Credit |
| Psychiatry and Neurology | No | — | — | — | — |
| Radiology | No | — | — | — | See footnote 3 |
| Surgery | Yes | Yes[1] | No | No | 2 years[4] |
| Urology | Yes | Yes[1] | No | No | 3 years |

1. Facilities and teacher qualifications must be approved by board.
2. Minimum of five years of training on a preceptorship will satisfy three year residency training requirement.
3. Credit for preceptor training to be considered at annual meeting, June 1948.
4. Preceptor training preceded by three years of acceptable residency training preferred.

## The Fetish of Perpetual Expansion

We have unfortunately come to accept expansion as inevitable and unending. Nobody even visualizes a time when our hospitals will be emptied instead of crowded, when the conquest of disease will lead, as it logically should, to the diminution of disease. We go further and seem to assume that such expansion is something desirable in itself. We pride ourselves on the cultivation of virgin soil rather than on the harvest. Consider, for instance, the plans recently envisaged for the development of clinical photography (within certain limits a desirable thing). According to one of its enthusiastic advocates the department of the future must have a medically qualified director, an assistant director, two photographers who must also be trained nurses, a microscopist with additional training in photomicroscopy, a secretary, an instrument mechanic, a nurse, and a porter. Accommodation must consist of one large main studio, 40 by 20 ft. (12.2 by 6.1 metres), three subsidiary studios, 15 by 10 ft. (4.8 by 3 metres), three small studios for the photography of small objects, seven dark- and accessory-rooms, a secretary's office, a filming-room, a director's room, dressing cubicles, linen-cupboards, lavatories, storerooms, and a small surgery. This, we are told, would suffice for the first three years; after that extensions would be necessary. Among the users of the department would be the welfare department, which would wish to "show the return of a healthy glow to the cheeks of a convalescent." A second enthusiast tells us that medical photography must become "a subject in our medical schools on an equality with radiology." A third tells us that the staff will need a lengthy and complete training. Spaciousness, he says, would be necessary in order to counteract "the demoralizing effect of cramped quarters." But, one may ask, were Louis Pasteur, J. J. Thomson, and Gowland Hopkins demoralized by the cellars in which their best work was done?

This is perhaps an extreme case, but it illustrates an attitude of mind from which many of us suffer. Ambition in its most virtuous form impels us to raise ourselves higher from the ground on a pyramid of ever-increasing subordinates and accommodation. We measure our success by the material growth of the things which we create, forgetting meanwhile that in many human activities, such as increase of population and exploitation of new countries, this standard has had to be abandoned. We see limit, either actual or implied, in all directions; in the wide adoption of birth control, in the world shortage of many necessities, in the control of entry to the universities, and in the predetermination of the size of the new satellite towns. We can therefore hardly maintain our faith in the inevitability of perpetual expansion in the one feature of social life whose reduction is essential to the prevention of the reduction of everything else.—Roberts, Frangcon, M.D.: Where Are We Going? Medicine in a Planned Economy. *British Medical Journal*, March 13, 1948.

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SATURDAY, JUNE 12, 1948

## EDITORIAL ANNOUNCEMENT

The absence of the compositors from their work continues. This issue of THE JOURNAL has been prepared in part by the use of Vari-Typer machines.

## POSSIBLE ALLERGIC CHARACTER OF ACUTE RHEUMATIC FEVER

Periarteritis nodosa has been reproduced by Rich and Gregory[1] in the experimental animal by creating conditions similar to those of serum sickness in the human being. Cardiac lesions were seen in the sensitized animal with many of the histologic characters of the specific rheumatic granuloma. Clark and Kaplan[2] had noted in the heart and testes of 2 patients who had had serum sickness shortly before death cellular infiltrations composed of mononuclear histiocytes and showing a similar distribution to those seen in rheumatic conditions.

E. Florence McKeown[3] sensitized rabbits by either intravenous or intraperitoneal injection of 10 cc. of horse serum per kilogram of body weight. Cutaneous flushing accompanied by rise of temperature and regarded as a sign of serum sickness occurred on the twelfth to fourteenth day. At this time reaction to a skin test was positive. On the seventeenth day after the first injection of serum, the rabbits were given an intravenous injection of 1 cc. of serum. Two days later the initial large dose of serum was repeated, and the animals were killed one week later. This procedure establishes in the experimental animal conditions similar to those obtaining in serum sickness in man. The sensitization of rabbits by this method produced lesions confined to the cardiovascular system. These lesions, McKeown emphasizes, have a specific histologic structure and a specific distribution. In the heart the earliest lesion appears to be a focal necrosis of collagen. These focal necroses are found in the paravascular tissues, the interstitial septums of the myocardium and the fibrous tissue of the valve ring and valves themselves. Associated with this necrosis an inflammatory reaction develops that is composed, in the acute phase, of polymorphonuclear and eosinophilic leukocytes, which are eventually replaced by large mononuclear cells of peculiar character and by Anitschkow cells. This poses the problem as to whether this serum lesion is a reduplication of the rheumatic granuloma.

McKeown[4] traced the evolution of the primary lesion, the Aschoff nodule, as well as its age in 36 cases of rheumatic fever. The lesion appeared to be a focal necrosis of collagen, followed by emigration of polymorphonuclear leukocytes and eosinophils. Such lesions were found in the valves, valve rings, endocardium and interstitial septums of the myocardium. The histologic structure and site of the experimental lesion appear to be indentical with the specific granuloma of the naturally occurring disease. The analogy is further supported by the occurrence of endocardial and valvular lesions of similar nature. All degrees of valvulitis are present in experimental animals, and in some this is the only manifestation of a serum lesion in the heart. The serum lesion was found most frequently in the mitral valve and was not observed in the pulmonary leaflet. Where the necrosis of collagen is deep in the substance of the valve the cellular infiltration and subsequent evolution of the lesion are identical with those seen in rheumatic fever. When the necrosis is more superficial the necrotic collagen appears to be extruded onto the surface of the valve as a vegetation or to stimulate a decided proliferation of the overlying endocardial and immediately subendocardial cells, so that there is a close resemblance to the palisading of cells so often seen in the valve of the human heart.

Analysis of these valvular lesions shows their close identity with those of rheumatic valulitis in the frequent involvement of the mitral valve, the focal nature of the mitral lesion and the similarity in type of reaction. Every stage of the whole process finds its parallel in the evolution of rheumatic valvular disease. A study of the coronary arteries showed that these are impli-

1. Rich, A.R., and Gregory, J.E.: The Experimental Demonstration that Periarteritis Nodosa is a Manifestation of Hypersensitivity, Bull. Johns Hopkins Hosp. 72: 65, 1943.

2. Clark, E., and Kaplan, B.I.: Endocardial, Arterial and Other Mesenchymal Alterations Associated with Serum Disease in Man, Arch. Path. 24: 458, 1937.

3. McKeown, E.F.: Experimental Serum Carditis and Its Relationship to Rheumatic Fever, J. Path. & Bact. 59: 547, (Oct.) 1947.

4. McKeown, E.F.: The Pathology of Rheumatic Fever, Ulster M.J., 14: 97, (Nov.) 1945.

5. MacIlvaine, Yvonne: The Relationship Between Rheumatic Carditis and Subacute Bacterial Endocarditis, J. Path. & Bact. 59: 557, (Oct.) 1947.

cated in precisely the same manner in the experimental animal as in rheumatic fever.

The investigators believe that the factor responsible for sensitization in acute rheumatism is the hemolytic streptococcus because of its frequent occurrence in the upper respiratory tract preceding an attack of acute rheumatic fever. Complete proof of this hypothesis, however, is still lacking.

The investigations of Yvonne MacIlwaine[5] throw light on the etiologic relationship between rheumatic and bacterial endocarditis. In a study of 34 cases of subacute and 12 cases of acute bacterial endocarditis she demonstrated that the myocardial Aschoff nodule is a specific reaction of the tissues to an attack of rheumatic fever and that the lesion evolves through an orderly and characteristic process of aging. A large number of the cases of acute and subacute bacterial endocarditis exhibited evidence of rheumatic arteritis. Aschoff nodules corresponding to the clinical duration of the endocarditis were observed in an even larger percentage of the cases. MacIlwaine concludes that in many cases of endocarditis lenta, and in a smaller number of cases of acute bacterial endocarditis, the bacterial lesion is superimposed on a heart which is at the time of infection the site of an active rheumatic carditis.

### CANCER HEMOLYSINS

Anemia is a frequent associate of cancer. Gross[1] of the Veterans Administration Hospital, New York, has observed a direct destruction of erythrocytes by species-specific hemolysins formed or liberated by the cancer cells. Tumor extracts were made from 10 different spontaneous mammary cancers from female mice of a cancer strain and from 2 different transplanted tumors originated as mammary cancers in such females and carried through successive transplantations. Cell suspensions varying from 15 to 30 per cent were made by grinding tumor tissue in sodium chloride solution; the suspensions thus obtained were either repeatedly centrifuged or passed through a filter to form a clear sterile aqueous extract. One cubic centimeter of a 1 per cent washed suspension of red blood cells from the same strain of mice was mixed with 0.5 cc. of this extract, and the resulting mixture incubated at 37 C. for 2 1/2 to 3 hours. The tubes were then centrifuged briefly at 3,000 revolutions per minute, and the percentage of hemolysin estimated colorimetrically. Complete hemolysis was designated as 3 plus, partial hemolysis as 2 plus, 1 plus, or plus or minus, and no hemolysis as zero. Two to 3 plus hemolysis was obtained from practically all filtrates when tested in full strength. One plus hemolysis was recorded with 1:2 dilutions, and plus or minus to zero hemolysis with 1:3 dilutions of the same extract. Higher dilutions of the extracts gave negative results. Under the conditions of the experiments there were no positive readings with control extracts made from normal healthy organs such as the liver, kidney or spleen. The hemolytic action of the cancer extract was significantly less for erythrocytes prepared from heterogeneous strains of mice. Hemolytic action was not observed with rabbit, guinea pig or human erythrocytes. The cancer extract was not materially reduced in hemolytic titer by heating to 56 C. for 30 minutes. The extract, however, was completely inactivated at 100 C.

From these data the investigator concluded that strain-specific carcinoma hemolysins are at least a partial explanation of the frequent development of anemia in patients with cancer. Hemolytic tests with extracts from human cancer cells are now in progress.

1. Gross, L.: Proc. Soc. Exper. Biol. & Med. 65: 292, 1947.

## Current Comment

### CIVIL DEFENSE PLANNING

On March 27, 1948 the Secretary of Defense issued a memorandum to the various components of the National Military Establishment, dealing with the creation of the Office of Civil Defense Planning. This office was charged with (among other functions) preparing and submitting "to the Secretary of Defense, a program of civil defense for the United States, including a plan for a permanent federal civil defense agency which, in conjunction with the several states and their subdivisions, can undertake those peacetime preparations which are necessary to assure an adequate civil defense system in the event of a war." Mr. Russell J. Hopley, president of the Northwestern Bell Telephone Company of Omaha, was appointed director of the Office of Civil Defense Planning. Mr. Hopley is utilizing the advice and assistance of both governmental and civilian agencies to the utmost because of his belief that planning for civil defense involves every one. A medical advisory committee consisting of representation from the Armed Forces, the Public Health Service, the Childrens Bureau, the Department of Interior, the Veterans Administration, the National American Red Cross, the National Research Council, the American Medical Association, the American Dental Association, the American Public Health Association, the American Nurses Association, the American Veterans Association and the American Hospital Association has been created to assist Dr. Perrin H. Long, medical advisor to the Office of Civil Defense Planning, in drawing the plans which will cover the medical aspects of the Civil Defense Program. The medical advisory committee expects shortly to

offer the broad outlines of a Medical Civil Defense Plan. Medical representation of civil defense planning groups at the state and community levels will be requested to keep in close contact with the activities of the Office of Civil Defense Planning; thus repetition and duplication of effort may be avoided and the coordination and integration of state and community plans into the over-all program will be made easier.

## SARANAC SYMPOSIUM ON THE BERYLLIUM PROBLEM

A symposium held at the Saranac Laboratory for the Study of Chest Diseases at Saranac Lake, N. Y., during the week of Sept. 29, 1947 attempted to bring together available data on the health hazards resulting from exposure to the beryllium compounds. The term acute pneumonitis of beryllium workers was adopted for the acute phase, which is characterized by acute irritation of the upper respiratory tract including pharynx, trachea and bronchi, with occasional cases of acute pulmonary edema. The acute reactions have been observed only in the beryllium extraction plants where the exposure is largely due to the acid compounds of beryllium, the sulfates and the fluorides. Reactions have not been seen from contact with the metal itself. Persons so afflicted had complete clearing of the lungs, and in none had there developed the pulmonary granulomatosis observed with exposure to other compounds. All patients with acute pneumonitis had exposure either to beryllium sulfate or beryllium fluoride. Acute cases were not seen unless there had been exposure of the worker to one or the other acid compound, or to both. This fact has led some authorities to believe that beryllium should not be implicated in these acute cases because the fluorides and sulfates of many metals are similarly toxic. The chronic phase was named pulmonary granulomatosis of beryllium workers because the unit lesion is a chronic granuloma composed of proliferative cells with widely scattered giant cells occurring in the lungs. Because of associated thickening of the walls of the air sacs, interference with exchange of gases occurs, with a resulting shortness of breath on exertion and occasional deaths from failure of the right side of the heart. The radiologic and the microscopic appearance of this granulomatosis bears definite resemblance to sarcoidosis. It differs from sarcoidosis in that spontaneous remissions and disappearance of the roentgenologic shadows have not been noted and sarcoid-like lesions of bones were not observed in the beryllium variety. Another characteristic of this condition is its delayed onset, since it occurs in some cases as long as five years after termination of the exposure. In less than 2 per cent of those who are exposed do the pulmonary changes develop. This has led to the belief that an unknown factor is necessary as a trigger mechanism. Also, none of the patients so far observed have had or have contracted active tuberculosis. These chronic granulomatous lesions have occurred in three industries: (1) fluorescent lamp manufacturing, (2) beryllium-copper alloy casting and (3) sign tube shops. Despite much animal experimentation, nothing conclusive has developed. The transition from acute irritation to the chronic unit lesion has not so far been observed. A plea was made that attempts to create a threshold limit should not be made until much more is known about these materials. The greatest increased use of beryllium will probably be in alloys of copper and various other metals as a hardener. Proceedings of the symposium will be published by the Trudeau Fund as a memorial to Dr. Leroy Gardner.

## CLEVELAND'S EMERGENCY MEDICAL SERVICE

For more than ten years the Academy of Medicine of Cleveland[1] has arranged to provide emergency medical service to the public at all hours, day and night, and has maintained at its own expense a twenty-four hour telephone service. The effectiveness of this arrangement, which serves not only the public but the police and fire departments as well, is shown in a study of three hundred recent emergency calls, all of which, however, did not turn out to be emergencies. The average time that elapsed between a telephone call to the academy and contact with a physician was only 8.7 minutes, and that includes fourteen long calls of from 35 to 118 minutes. Not one of the long calls was a real emergency, and in each instance the circumstance surrounding the call explained the lapse of time. The average of 8.7 minutes does not show entirely the efficiency of this emergency service, as 69 per cent of the 300 calls were completed in five minutes or less and 83 per cent in ten minutes or less. The most difficult hour to obtain service was from 6 to 7 p.m., when physicians are on their way home or making calls on their own emergency patients. The length of time necessary to contact the physician was determined by the number of prior emergency calls and the desire of the patient to be served by a certain type of specialist. The telephone operator at the Academy of Medicine always asked for the name of the family physician and whether or not he had been called. A total of 77 physicians took care of the three hundred calls. In 71 per cent of 214 calls the first physician reached by the operator agreed to make the call. Certainly the income received by the 77 physicians was not their chief concern. Many patients who said that they could pay did not, some obviously could not, and a few who should pay would not. The physician sometimes was called at night into a dark neighborhood where the police or the family may have called a doctor, who was there when the academy physician arrived. Occasionally he responded to a frantic plea to find that a patient who had been injured on the way home had gone out again. Sometimes after making a call the physician found that his car had been broken into and the contents stolen. Such emergency service at night illustrates the sacrifice a doctor must make in attempting to attain the ideals of his profession. Methods similar to those used in Cleveland are now in effect in many other localities.

1. Caldwell, H. V. Y.: Bull. Acad. Med., Cleveland 33:7 (April) 1948.

# ORGANIZATION SECTION

## Official Notes

### RADIO BROADCASTS FROM ANNUAL MEETING

Owing to the fact that the Annual Meeting of the American Medical Association coincides with the Republican National Convention, arrangements for radio broadcasts are very difficult and it is impossible to announce the exact time for many broadcasts in advance.

Following is the tentative schedule of broadcasts:

Network, station, date and time are indicated when available; otherwise information must be sought in newspaper radio columns during the Annual Meeting. It may even be necessary to record some of the programs and broadcast them during the week following the meeting.

(All time is Central Daylight time, which is Chicago time.)

| | |
|---|---|
| NBC-WMAQ | Dr. Edward L. Bortz, President of the American Medical Association; Mrs. Luther H. Kico, President of the Women's Auxiliary, and Dr. Elmer L. Henderson, Chairman of the Board of Directors, *The American Medical Association Serves the Nation.* |
| CBS-WBBM | Adventures in Science Program; Dr. R. L. Sensenich, President-Elect of the American Medical Association, *Medical Preparedness.* |
| NBC-WMAQ | Dr. E. E. Bauer (tentative), *Convention News and Highlights.* |
| CBS-WBBM | Dr. Louis Bauer, Dr. Charles Gordon Heyd, Dr. Henry B. Mulholland and Dr. A.C. Ivy, *Symposium on Medical Progress.* |
| ABC-WENR | Dr. Roy W. Fouts, Dr. F.F. Borzell and other delegates, tape recording of interviews at opening meeting of the House of Delegates. |
| Mutual-WGN | Tape recording interview at the American Medical Association Scientific Exhibit with winners of Gold and Silver Medals. |
| WMAQ | "Elizabeth Hart Presents": Dr. L.I. Dublin, of the Metropolitan Life Insurance Company, *Progress in Maternal and Infant Welfare.* |
| WCFL | Dr. V.G. Townsend, U.S. Public Health Service, Washington, D.C., interviewed by Patricia Gleason: *Occupational Hazards in Industry.* |
| WAAF | Mr. Oren C. Durham, of Abbott Laboratories, *Hay Fever Pollen Research.* |
| WAIT | Dr. David Thurber, Rochester, N. Y., *Barbiturate Poisoning.* |
| WEDC | Dr. Willis Sachett Knighton, New York, *Glaucoma.* |
| WGES | Dr. G. Foard McGinnes, Washington, D.C., *Call for Blood.* |
| WIND | Dr. Claire L. Straith, Detroit, *Plastic Repair of Automobile Injuries.* |
| WJJD | Dr. O.P. Kimball, Cleveland, *Prevention of Endemic Goiter.* |
| WJOL | Dr. Lawrence Jones, Beverly Hills, Calif., *Low Back Pain.* |
| WLS | Dr. F.S. Crockett, Lafayette, Ind., Art Page's guest on the "Dinner Bell Program" at 12:30 p.m. Tuesday, June 22. |

## Washington Letter

*(From a Special Correspondent)*

June 11, 1948.

### World Health Bill to White House for Signing

The bill authorizing the United States to participate in the World Health Organization has been enacted into law. The House and Senate passed Senate Joint Resolution 98 and sent it to the White House for signature prior to President Truman's departure on his western speaking tour. The House act authorized an appropriation not to exceed $1,920,000 annually as this country's contribution to the organization. The measure also exempts the United States from commitments to any special legislative action of the World Health Organization, which is a part of the United Nations and is connected with the group's Economic and Social Council.

### Search for Atomic Weapon Against Cancer

A joint research program of the Atomic Energy Commission and the Office of Naval Research is studying the effects of atomic radiations on people, animals and plants, and is emphasizing a search for atomic weapons against cancer. The program includes thirty-eight different research projects to be conducted in twenty-nine schools and hospitals in this country. The studies will include exploration of the effects of atomic radiation, similar to that released by atom bombs, on living cells and will also explore causes, diagnosis and treatment of cancer. Through the use of radioactive atoms, traced by detecting devices as they move through plant and animal bodies, the research workers expect to learn more about how nerves function and nourish themselves, how plants utilize minerals and how atomic radiations alter genes, living molecules which determine hereditary characteristics.

### Scientists Advise Army on Training of Specialists

The United States Army is receiving the advice of more than fifty of the nation's leading civilian scientists, it was revealed here when they met to consult with officials on recruitment, training and the use of qualified young scientists to fill three hundred and fifty specialist positions in the Army Medical Service Corps. Speakers at the two day conference included Dr. Vannevar Bush, chairman, Research and Development Board, and Brig. Gen. George E. Armstrong, Deputy Surgeon General of the Army. Major R. Roland Kuhn was appointed chief of the medical allied sciences section of the Medical Service Corps.

### Committee Approves Clinic for Federal Employees

The House Appropriations Committee approved the continuation of the experimental federal health clinic in Denver, which is regarded here as indicating that governmentwide health clinics may be expected in the next two years. Committee members who expressed fear that the project may be "an attempt toward socialized medicine" were shown communications from the American Medical Association endorsing the plans. The program calls for: treatment of on the job illness and dental conditions requiring emergency attention; preemployment and periodic examinations; referral of employees to private physicians and dentists, and preventive programs relating to health.

# GOVERNMENT SERVICES



## ARMY

### WALTER REED'S BUST IN HALL OF FAME

For the ceremony of unveiling Walter Reed's bust in the Hall of Fame on the campus of New York University, May 20, the printed program contained excerpts from letters written in longhand by Major Reed to Major J. R. Kean and to Mrs. Reed, his wife, at the time his famous experiments were under way and when the discovery of the method of transmission of yellow fever was made in 1900. The program contains also a picture of the birthplace of Major Reed in Belroi, Va.; of Camp Lazear where the experimental work was done; of the shack where some of the experiments were carried on; of the flight of the population during outbreaks of yellow fever in Newport News, Va., and other Southern states; of Reed's colleagues in the experimental work; of medals awarded; of the U. S. Army Walter Reed General Hospital, and a list of the approximately one hundred Americans whose names have been inscribed in the Hall of Fame at the university. Major Reed is the only physician in the list.

The bust of Major Reed was unveiled by his son, Major General Walter L. Reed, U. S. Army (retired). The Surgeon General of the Army, Major General Raymond W. Bliss, paid tribute to Major Reed. Dr. Wilbur A. Sawyer, executive secretary of the Organizing Committee of the fourth International Congresses on Tropical Medicine and Malaria, gave the address. Dr. Edward I. Salisbury, medical director, United Fruit Company, made the presentation and Gladys Swarthout of the Metropolitan Opera Company sang a number of selections.

### MEDICAL MEETING IN KOREA

During the monthly meeting of officers of the Army medical department in Korea at the 34th General Hospital, April 21, many cases were presented during ward rounds and conferences, following which Capt. Rudolph H. Beckert read a paper on "Infections of the Lower Portion of The Urinary Tract," discussed by Lieut. Ross H. Miller, of the 382d Station Hospital. Capt. Harry C. Swanstrom, 34th General Hospital, presented a paper on "Cutaneous Medicine," discussed by Major M. B. Guthrie, dermatologic consultant Lieut. Manuel D. Altamirano, parasitologist, discussed "Intestinal Parasitic Infections in Korean Food Handlers." Capt. Chester T. Hino discussed "The Sanitary Habits of Korean Food Handlers," and Major M. B. Guthrie, "The Treatment of the Common Dermatoses." About sixty-five officers attended, including Brig. Gen. James A. Bethea, surgeon, F. E. C.; Col. J. A. Isherood, radiologic consultant, and Lieut. Col. Rosalie B. Calhoun, director of nurses. A dinner in honor of General Bethea was held at the officer's club. A bus met train 6 from Pusan to transport visiting officers to the meeting.

### ARMY MEDICAL LIBRARY

The Army Medical Library has adopted the principle of free loan of microfilms for research workers. Such films may be retained for ninety days, and requests for them should be submitted on standard order forms through local libraries, research institutes or government agencies. Those who wish to keep the films permanently and those who wish photostats may obtain them at 5½ cents per unit.

Representatives of the Army Medical Library have been visiting library schools to recruit candidates for positions in the Subject Cataloging Section. The qualifications include good subject knowledge of medicine and good foreign language knowledge. The salary range for this grade P-2 is $3,397.20 to $4,149.60.

### SELECTED FOR SPECIAL CIVILIAN COURSES

The Surgeon General announces the selection of the following medical officers for specialized courses in civilian institutions:

Lieut. Col. Victor R. Hirschmann, training in mycology, Duke University School of Medicine, Durham, N. C.

Lieut. Col. Maurice C. Davidson, course in clinical heart disease, Harvard Medical School, Boston.

Col. Robert S. Bruo, training in orthopedic surgery at Carrie Tingley Hospital for Crippled Children, Hot Springs, N. Mex.

Major Walton N. Edwards, a course in pediatrics, University of California Medical Center, San Francisco.

Lieuts. Flora Moore, A. N. C., and Blanche Zukovski, A. N. C., course in anesthesiology, St. Mary's Hospital, Galveston, Texas.

Col. George H. Donnelly and Lieut. Col. Merrill M. Judd, course in surgical anatomy, Cornell University Medical College, N. Y.

Major John E. Boysen, course in industrial medicine, Kettering Laboratory of Applied Physiology, University of Cincinnati College of Medicine.

### EDGAR E. HUME PROMOTED

Col. Edgar Erskine Hume, M.C., has been promoted to the rank of brigadier general. The stars of his rank were presented in a surprise ceremony at the home of Major General David G. Barr on his arrival in China, April 27. General Hume during the recent war held the temporary rank of brigadier general, participating in the African, Sicilian and Italian campaigns. He was chief of public health in Sicily in 1943, chief of allied military division for Fifth Army from 1943 to 1945 and assistant chief of staff of the U. S. forces in Austria in 1945. He is a graduate of Centre College, Danville, Ky., and Johns Hopkins University Medical School, where he also received the degree of doctor of public health. He also holds honorary degrees from American and foreign universities.

### APPOINT CHIEF OF ALLIED SCIENCES SECTION

The Surgeon General announces the appointment of Major F. Roland Kuhn as chief of the Medical Allied Sciences Section of the Medical Service Corps. Fourteen professional and scientific societies were called to the Surgeon General's office in May to advise on recruitment, training and use of qualified young scientists to fill three hundred and fifty specialists' positions in the Medical Corps of the Medical Department. Major Kuhn, who is bacteriologist at the Army Medical Research Department and Graduate School in Washington, presided. Major Kuhn received a Ph.D. at the University of Chicago in 1936 and did research there and at the University of Georgia until 1942, when he entered the Army. He served overseas in the India-Burma theater as bacteriologist with the 29th Medical Laboratory and later with the 6th Army Medical Laboratory before coming to Washington, D.C.

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## AWARDS AND COMMENDATIONS

### Captain Frank L. Richardson

The Silver Star was awarded to Capt. Frank L. Richardson, M. C., U. S. A., now of Portland, Ore., for gallantry in action in Luzon, Philippine Islands, on Dec. 8, 1941. The citation reads as follows: When large forces of enemy aircraft attacked a small airstrip on the west coast of Luzon, Capt. Richardson, surgeon, 3d Pursuit Squadron, left his regular station in a medical dugout during a strafing and bombing attack, and without regard for his personal safety proceeded to the fire-swept area where he administered medical aid to the wounded and rescued several men from burning buildings. By his indomitable spirit and willingness to risk his life for the welfare of his comrades, Captain Richardson set an example of outstanding courage and exemplified the highest traditions of military service. Dr. Richardson graduated from the University of Minnesota School of Medicine in 1937 and entered military service in February, 1941.

# NAVY

## RESIDENCY IN GENERAL PRACTICE

The Surgeon General of the Navy, Rear Admiral Clifford A. Swanson, announces that a new residency in general practice will be inaugurated in naval hospitals July 1. The program will cover a period of three years, during each of which medical officers will receive six months of training in general medicine and related specialties and six months in general surgery and related specialties. Instruction will be provided by the staffs of naval hospitals and by outstanding civilian visiting staffs.

## NAVAL FLIGHT SURGEONS

Fifteen Naval Medical officers, three Public Health Corps officers and one medical officer of the Brazilian Air Force recently received designations as naval flight surgeons on completion of a course of study at the Naval Air Station, Pensacola, Fla. Following are the names of those designated as naval flight surgeons.

Lieut. (jg) Joseph Bader (MCR), U. S. N. R., Edinburg, Texas.
Lieut. (jg) John M. Clark (MCR), U. S. N. R., Milwaukee.
Lieut. (jg) William J. Dowling (MCR), U. S. N. R., Oklahoma City.
Lieut.(jg) Richard H. Hardin (MC), U. S. N., Rocky Mount, N. C.
Sr. Asst. Surgeon William A. Himmelsbach, U. S. P. H. S., Northhampton, Mass.
Lieut. (jg) Bruce C. Holman (MC), U. S. N., Bainbridge, N. Y.
Lieut. (jg) Ernest L. MacQuiddy Jr. (MCR), U. S. N. R., Omaha.
Lieut. (jg) Harry B. McGee (MCR), U. S. N. R., Saginaw, Mich.
Lieut. (jg) Walter A. McLeod Jr. (MCR), U. S. N. R. St. Petersburg, Fla.
Lieut. (jg) Richard D. Nauman (MC), U. S. N., Richmond, Va.
Lieut. (jg) Paul H. Powell Jr. (MCR), U. S. N. R., Woodville, Texas.
Lieut. (jg) Thomas J. Reeves (MCR), U. S. N. R., Waco, Texas.
Lieut. (jg) Robert J. Remmer (MCR), U. S. N. R., Utica, N. Y.
Asst. Surgeon Henry C. Savage, U. S. P. H. S., Ogden, Utah.
Lieut. (jg) Donald W. Stechschulte (MCR), U. S. N. R., Windber, Pa.
Asst. Surgeon Alan F. Thometz, U. S. P. H. S., Oak Park, Ill.
Capt. Fernando R. Santos, Brazilian Air Force.

## AVIATION MEDICAL EXAMINERS

Twenty-three Naval Medical Officers received their designations as aviation medical examiners at the Naval Air Station, Pensacola, Fla., after completing a twelve week course of classroom, laboratory and field work. Following are the officers who were graduated as aviation medical examiners:

Lieut. (jg) John M. Barb (MRC), U. S. N. R., Camden, N. J.
Lieut. (jg) Bruce B. Barnhill (MC), U. S. N., Corning, Ark.
Lieut. (jg) Victor F. Carey (MCR), U. S. N. R., Downsville, La.
Lieut. (jg) Louis A. Collins, Jr. (MC), U. S. N., Augusta, Ga.
Lieut. (jg) Rene A. Desjardins (MCR), U. S. N. R., Salem, Mass.
Lieut. (jg) Robert A. Driscoll (MCR), U. S. N. R., Milton, Mass.
Lieut. (jg) Joseph E. Foehr (MCR), U. S. N. R., Garden City, N. Y.
Lieut. (jg) Sidney C. Foster (MCR), U. S. N. R., South Orange, N. J.
Lieut. (jg) James F. Grant (MCR), U. S. N. R., Syracuse, N. Y.
Lieut. (jg) James R. Guthrie (MCR), U. S. N. R., Greensburg, Ind.
Lieut. Comdr. Henry B. Jenkins (MCR), U. S. N. R., Stillwater, Okla.
Lieut. (jg) Richard F. Jones (MCR), U. S. N. R., Tacoma, Wash.
Lieut. (jg) Clarence J. Kessler (MCR), U. S. N. R., Tamaqua, Pa.
Lieut. (jg) Harry T. Linger (MCR), U. S. N. R., Clarksburg, W. Va.
Lieut. (jg) Thomas G. Lyons (MCR), U. S. N. R., Stockton, Calif.
Lieut. (jg) Clyde F. Newman Jr. (MCR), U. S. N. R., Shreveport, La.
Lieut. (jg) John M. Packard (MC), U. S. N., Saranac Lake, N. Y.
Lieut. Comdr. Lloyd E. Regan (MCR), U. S. N. R., David City, Neb.
Lieut. (jg) Holley V. Reed (MCR), U. S. N. R., Newburgh, N. Y.
Lieut. (jg) Warren G. Strout (MCR), U. S. N. R., Dexter, Maine.
Lieut. (jg) John W. Tope III (MCR), U. S. N. R., Oak Park, Ill.
Lieut. (jg) Calvin B. Tribiano (MCR), U. S. N. R., Staten Island, N. Y.

## NEW REGULAR OFFICERS

The following additional members of graduating classes of medical schools have accepted appointments as lieutenants (junior grade) in the Medical Corps of the Regular Navy: Frank H. Austin Jr., Dallas, Texas; David H. Beyer, St. Paul; Robert B. Bunker, Westwood, Mass.; Frank D. Burns, Harrisburg, Pa.; LeRoy K. Branch, Lettsworth, La.; Deck E. Chandler, Salt Lake City; Frederick E. Drew, New Orleans; Raymond W. Laurence, Staten Island, N. Y.; Ernest G. McKay, Tampa, Fla.; Wayne S. McKinley, Brookville, Pa.; John R. McLaren, Blairsville, Pa.; Deane E. McLeod, Brookville, Pa.; John C. Ready, Arlington, Mass.; Francis D. Riley, Philadelphia; William A. Snyder, Baltimore; Charles V. Treat, Jamestown, N. Y.; Harvey F. Watts, Philadelphia; Martin G. Webb Jr., Glen Olden, Pa.; John D. Wilson, Beaver, Pa., and Robert J. Zullo, Port Reading, N. J.

Medical officers on active reserve status who have recently accepted appointments in the Medical Corps of the Regular Navy include the following: Lieut. Comdr. Ralph L. Ealick, Raytown, Mo.; Lieut.(jg) John P. Colmore, Noroton Heights, Conn.; Lieut. (jg) Verne K. Harvey Jr., Alexandria, Va.; Lieut. (jg) Garner L. Lewis, Kingston, N. Y., and Lieut. (jg) James T. Proctor, Kansas City, Mo.

# Medical News

(Physicians will confer a favor by sending for this department items of news of general interest; such as relate to society activities, new hospitals, education and public health. Programs should be received at least two weeks before the date of meeting.)

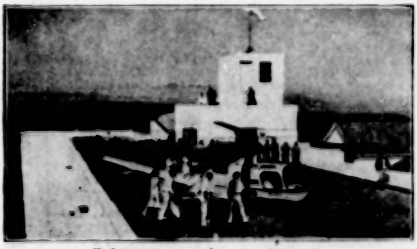
## ARIZONA

**New State Tuberculosis Association.**—The thirty year old Arizona Antituberculosis Association was voted out of existence at the organization's annual meeting in Phoenix January 23, and the new Arizona Tuberculosis and Health Association was formed to take its place. E. W. Montgomery, Phoenix, was named president.

**State Medical Election.**—At the annual meeting of the Arizona State Medical Association in Phoenix, May 19-21, Dr. Harold W. Kohl, Tucson, became president. Other officers for 1948-1949 are: Drs. Robert S. Flinn, Phoenix, president-elect, Frank J. Milloy, Phoenix, secretary, and Clarence E. Yount, Prescott, treasurer. The state society formed its first Fifty Year Club. Charter members included Drs. Francis W. Allen, Tucson, Lewis A. W. Burtch, Phoenix, Timothy T. Clohessy, Phoenix, Guy H. Fitzgerald, Tucson, Delamere F. Harbridge, Phoenix, Robert N. Looney, Prescott, William R. Lyon, Tucson, E. Payne Palmer, Phoenix, Harry A. Reese, Yuma, Alexander M. Tuthill, Phoenix, and Clarence E. Yount, Prescott. They were presented bronze plaques at the dinner meeting.

## CALIFORNIA

**The First Hospital Heliport.**—Dedication of the two hundred and fifty bed Herrick Memorial Hospital of Berkeley took place May 9; three days later its roof heliport, believed to be the first of any hospital, was opened. Formerly the Berkeley Hospital, Herrick Memorial Hospital has incorporated many of the old buildings. Modern features include a pneumatic tube system for the transfer of messages, records and drugs from department to department and a radio call system throughout the hospital. The helicopter ambulance provides an emergency facility which has been designed with elevators running directly from the heliport to the operating room. Herrick Memorial Hospital maintains an emergency hospital for citizens of Oakland, Berkeley, Albany and other adjacent areas. The heliport is expected to help solve the hospital bed shortage in rural communities.



Helicopter on hospital roof.

## CONNECTICUT

**Yale University Council Medical Affairs Committee.**—The Yale University Council of nineteen standing committees has been created to study the major constituent parts and activities of the university and develop plans for their support. The council is composed of alumni from various sections of the country. Chairman of the committee on the Division of Medical Affairs is Reginald G. Coombe, president, board of managers, Memorial Hospital for Treatment of Cancer and Allied Diseases, New York. Other members include Thomas P. Murdock, chairman of the council, Connecticut State Medical Society, Meriden, Conn; Barclay Robinson, Chairman, executive committee, Hartford Hospital; Robert E. Hunter, Pasadena, Calif., and Daniel C. Elkin, Whitehead Professor of Surgery, Emory University School of Medicine, Atlanta, Ga. Once a year each committee will report its findings and recommendations to the council as a whole, to be approved and transmitted to the president and the University Corporation.

## ILLINOIS

**Results of Hearing Survey.**—Audiometric examinations given to 20,644 pupils in one hundred and eighty-eight public and parochial schools in Will County during the past seven months indicated that almost 8 per cent of all children have a hearing deficiency in one or both ears. The pilot survey was conducted by representatives of the University of Illinois College of Medicine, the Illinois Eye and Ear Infirmary, the Division of Services for Crippled Children and the Will County Department of Health, together with cooperating agencies. The children were examined by Drs. Arnold A. Grossman and Richard E. Marcus, Chicago, at seventy-seven different otologic clinics throughout the county. Those requiring further care, either to rehabilitate or to conserve hearing, were referred for definite treatment to the local otologists and general practitioners. Recommendations for specific educational requirements for those found to have handicapping hearing losses will be prepared by a special subcommittee before next September. The Will County hearing project is expected to serve as a model for future hearing conservation programs in other counties of the state.

### Chicago

**Dr. Ivy Appointed to Argonne National Laboratory.**—Dr. Andrew C. Ivy, vice president of the University of Illinois in charge of the Chicago Professional Colleges, has been appointed to the board of the Argonne National Laboratory for a period of three years. Dr. Ivy was nominated for the position by the unanimous vote of the Council of Representatives of the participating institutions of the laboratory.

**Ophthalmological Society.**—The Chicago Ophthalmological Society on May 19 elected Dr. Arlington C. Krause president and Dr. J. Robert Fitzgerald secretary-treasurer. At the society's annual second Clinical Conference, November 28-December 4, special attention will be given to the pathologic and clinical aspects of glaucoma and retinal diseases, and advances in ophthalmic therapeutics. For information address Miss Maud Fairborn, 8 West Oak Street, Chicago 10.

**Commemorate Founding of University Clinics.**—The Alumni Association of the University of Chicago School of Medicine, commemorating the twentieth anniversary of the founding of the University Clinics, will hold its first alumni-resident staff reunion banquet at 6 p.m. Wednesday, June 23, at the Shoreland Hotel. Invitations have been sent to more than eight hundred persons. The speakers include: Chancellor Robert M. Hutchins, Drs. Lowell T. Coggeshall, Lester R. Dragstedt, Walter L. Palmer, Lucien A. Gregg and John Van Prohaska. Dinner reservations may be made through Miss Marie J. Eckert, secretary, Medical Alumni Association, 950 East 59th Street, Chicago 37.

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## KANSAS

**William Menninger Honored.**— Dr. William C. Menninger, Topeka, who was chief of the neuropsychiatric consultants' division in the Surgeon General's Office of the Army during the war, assumed office as president of the American Psychiatric Association at its one hundred and fourth meeting in Washington in May. At the same meeting Dr. Menninger was awarded the Chevalier of the French Legion of Honor presented to him by Lieut. Gen. Maurice Mathenet, military attaché of the French Embassy.

**Name Head of Department of Bacteriology.**—Lawrence W. Slanetz, Ph. D., will become professor of bacteriology and head of that department at the University of Kansas School of Medicine, Lawrence-Kansas City, on July 1, succeeding Dr. Noble Sherwood, head of the department for thirty years, who has passed the age of mandatory retirement from administrative duties but will continue to teach. Dr. Slanetz has been at the University of New Hampshire since 1932 and since 1938 has been bacteriologist of the state agricultural experiment station at Durham, N.H.

## MAINE

**State Medical Meeting.**—The Maine Medical Association will hold its annual meeting at Poland Spring House, Poland Spring, June 20-22, under the presidency of Dr. Stephen A. Cobb, Sanford. A symposium on hypertension and round table discussions will take place Tuesday morning. Four general practitioner conferences, the daytime feature of the scientific program, will run from 9:30 to 11:30 a.m. and 2 to 4:00 p.m. on Monday and Tuesday. The annual dinner will be held at 7 p.m., when presentation of Fifty-Year Medals will be made. Banquet speakers will be Major General Lewis B. Hershey, Washington, D.C.

**Graduate Study at Bar Harbor Laboratory.**—The Roscoe B. Jackson Memorial Laboratory at Bar Harbor has established a program of graduate study which will be developed in cooperation with leading graduate schools. Students must satisfy residence and course requirements of the graduate school of their choice, and be sponsored by a staff member of the Jackson Laboratory, where at least part of the work will be done. Current research at the laboratory centers on the relation of genetics to growth processes and to the development of social behavior. Some part time assistantships at the laboratory are available. Inquiries should be addressed to Graduate Study Committee, Roscoe B. Jackson Memorial Laboratory, Box 78, Bar Harbor, Maine.

## MICHIGAN

**Extend Rapid Treatment Service.**—The Michigan Rapid Treatment Center for venereal disease, Ann Arbor, has established a service of special benefit to physicians and patients in rural areas. Any practicing physician in Michigan may send his patient to the center for diagnosis of syphilis and for recommendations regarding treatment. The new service affords consultation not otherwise readily available in many sections of the state; it will allow the patient to be treated by his own physician in his home locality. The center has treated 10,000 patients with venereal disease referred from practicing physicians and clinics during the past four years; it now admits about 200 patients a month for treatment, has a medical officer in charge and, normally, three resident physicians. Personnel of the new consultation service will afford the benefit of their specialized knowledge to a greater share of the state's population.

## NEW JERSEY

**Atomic Research.**—Robert Ballentine, Ph. D., of Columbia University, New York, has been appointed effective July 1, an associate research specialist in the Rutgers University Bureau of Biological Research. He will be assigned for one year to the Brookhaven National Laboratory, which is supported by the United States Atomic Energy Commission, to train personnel and to make available special technics to universities for promotion of research in radioactive isotopes. Dr. Ballentine, having received his doctor's degree from Princeton, joined the staff of Columbia University in 1942 and in 1946 took a year's leave of absence to accept the John Simon Guggenheim Memorial Foundation fellowship, working at the California Institute of Technology on organic chemical approaches to protein structure.

## NEW YORK

**Occupational Therapy in State Institutions.**—Extension of occupational therapy to all patients whom it can benefit in the twenty-six hospitals and schools of the New York State Department of Mental Hygiene has been made possible by the provision of two hundred and nine new positions, Dr. Frederick MacCurdy, Commissioner of Mental Hygiene, has announced. The positions became available through funds recommended by Governor Dewey and approved by the legislature. The department of mental hygiene recently completed a survey to determine the occupational therapy needs of all types of patients in the state hospitals and schools. Most of the new positions are at the occupational instructor and the occupational aide levels.

### New York City

**Personal.**—A Gold Medal was presented to Dr. Jacob M. Gershberg after twenty years of service to the International Association of Spanish Speaking Physicians at the recent banquet in his honor at the Waldorf Astoria. Among the guest speakers were ambassadors and consuls of foreign countries and the former president of Chile.

**Pharmacology Research Laboratory.**—The Alumni Association of the New York University College of Medicine has inaugurated a campaign to raise $250,000 to create a laboratory for research in pharmacology at the New York University-Bellevue Medical Center in the memory of the late Dr. George B. Wallace, founder of the department of pharmacology at the university, who died Jan. 15, 1948.

**Standardized Antigens.**—Arrangements have been made for the Department of Health to furnish standardized Venereal Disease Research Laboratory cardiolipin-lecithin antigen, Mazzini and Kolmer antigens to the twenty serologic laboratories of the Department of Hospitals, Bellevue Hospital. Technicians from the laboratories of the Department of Hospitals will be trained in the use of these antigens in the laboratories of the department of health.

**Dr. Clark Appointed Dean.**—Dr. Duncan W. Clark, associate dean and assistant professor of medicine, has been appointed dean of the Long Island College of Medicine, Brooklyn, effective July 1, succeeding Dr. Jean A. Curran, who has served as dean since 1937 and as president and dean since 1942. Dr. Clark is a graduate of the College, 1936, was resident physician at Kings County Hospital and in 1940-1941 held a Commonwealth Fund Fellowship at the Yale University School of Medicine, New Haven. He has been secretary of the faculty and chairman of the curriculum and internship committees and has served as director of the student health department since 1941.

## OHIO

**Blankenhorn in the Far East.**—Dr. Marion A. Blankenhorn, professor and head of the department of medicine, University of Cincinnati College of Medicine, is on a five week teaching assignment in the Far East for the Surgeon General of the Army. The purpose of the trip is to aid in promoting and improving medical care and instruction in army medical installations in the Far Eastern Command, an assignment in line with the new program of the Army Medical Corps, which sends outstanding members of faculties abroad for short terms of intensive instruction.

**Dr. Harding Appointed President of College.**—Dr. George T. Harding, clinical professor of psychiatry, Ohio State University College of Medicine, and medical director of the Harding Sanitarium, Columbus, Ohio, has been elected president of the College of Medical Evangelists, Loma Linda and Los Angeles, effective September 1. Dr. Walter E. Macpherson, for six years president of the College, will become vice president and chairman of the section on medicine. Dr. Harding, a graduate of the college of Medical Evangelists in 1928, is a consultant in neuropsychiatry at the Children s Hospital, Grant Hospital and Starling-Loving University Hospital in Columbus. He is a member of the board of trustees of the Franklin County Tuberculosis Hospital in Columbus, an examiner on the American Board of Psychiatry, chairman of the Mental Hygiene Committee of the Ohio State Medical Association, a past president of the Columbus Academy of Medicine and forner councillor of the Ohio State Medical Association.

## OREGON

**Graduate Course Schedule.**—The University of Oregon Medical School, Portland, has revised its graduate course schedule to the following: September 27 to October 1, Diagnosis and Treatment of Diseases of Malignant Growth; October 18-22, General Surgery; October 25-29, Cardiology; November 1-5, Radiology; November 15-19, Gynecology; November 29 to December 2, Diseases of the Chest.

**Eastern District Society Meeting.**—The annual meeting of the Eastern Oregon District Medical Society will be held at Baker, June 25-26. Subjects to be discussed include: common eruptions of the hands, advances in endocrinology, roentgen examination of the upper part of the gastrointestinal tract, common anorectal complaints and infant and child feeding. At the banquet at 7 p.m., Dr. William W. Baum, Salem, will speak on " The Outlook for American Medicine."

## TEXAS

**Rheumatism Association.**—The Texas Rheumatism Association was recently founded for the purpose of stimulating interest among physicians in problems dealing with chronic arthritis, rheumatic diseases and other allied conditions manifested by symptoms referable to the musculo-skeletal system. Dr. Howard C. Coggeshall, Dallas, was elected president and Dr. Paul J. Thomas, Dallas, Secretary.

**Personals.**—Charles M. Pomerat, Ph.D., director of the Tissue Culture Laboratory, University of Texas Medical Branch, Galveston, spent a week during May, at the invitation of the Mexican Government, in developing tissue culture methods in the biology and medical institutes of Mexico City.—Dr. Eric Ogden, professor of physiology, University of Texas Medical Branch, will be a guest speaker in August at the University College Hospital, London, England. Dr. Ogden will also attend the Glasgow meeting of the Physiology Society.

## TENNESSEE

**Grant for Research.** — The U. S. Public Health Service has made available a grant of $6,000 to the University of Tennessee College of Medicine, Memphis, for a study of the relation between the motility of the pyloric sphincter and the process of gastric evacuation. This investigation is under the control of John P. Quigley, Ph. D. An additional grant of about $8,000 has been awarded for the support of studies by Richard H. Overman, Ph. D., on the water and ionic imbalances which occur in malaria and related states. About $7,000 has been allocated to Drs. Theron S. Hill and Richard H. Overman, Ph. D., for studies on the physiologic-psychiatric alterations which occur in premenstrual tension states.

## WEST VIRGINIA

**Organize Health Councils.**—Countywide health councils have been established at Fairmont, Clay, Martinsburg and Charleston, under the sponsorship of the state department of health. In addition, a community health council is functioning at Ansted under the name, "Ansted Health Club." Another countywide council was put in operation in Mccountry on April 1. Each council except the one located at Clay provides voluntary service to local health departments and carries on studies of health problems. The Clay council functions in matters of school health only. Five community school health councils have been established in Boone County under the direction of the public health educator attached to the county health department at Madison. Eight community-school Negro health councils have been organized in McDowell County and five in Mercer County. During the past two years, twenty-two school health councils have been organized under the supervision of the state department of education. The state health department plans to continue efforts to organize health councils on a countywide or community basis and to encourage the organization of school health councils.

## WISCONSIN

**State Society Purchases Home.**—The State Medical Society of Wisconsin has purchased a two and one-half story brick building on Gorham Street in Madison as its new home. Space will be available for offices of the Wisconsin Veterans Medical Service agency and Wisconsin Physicians Service, as well as a meeting room for the council and society committees.

**Dr. Cary's Library.** — Marquette University School of Medicine, Milwaukee, has acquired the library of the late Dr. Eben J. Carey, as a gift from Mrs. Carey. The collection is made up of some volumes now out of print and books in the fields of neuroanatomy, anatomy and histology, biophysics of radiation and the relation of medicine to other sciences. Special bookplates will identify books from this collection, which will be absorbed in the regular library.

**Surgical Meeting.**—The Wisconsin Surgical Society held its annual meeting in Marshfield May 15 with operative clinics and papers on peritoneal lavage for uremia, surgery on diabetic patients, preparation for thyroid patients for surgery, roentgen ray in carcinoma of the breast and carcinoma of the colon and its management. The dinner speakers were Dr. Erwin R. Schmidt, Madison, " The Changing Horizon in Surgery" and Dr. Richard L. Varco, Minneapolis, "Surgical Treatment of Congenital Anomalies of the Heart and Great Vessels." Officers elected were Dr. Carl W. Eberbach, Milwaukee, president-elect, and Dr. Warner S. Bump, Rhinelander, secretary-treasurer.

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## GENERAL

**Diplomates' National Board Meeting.**—The Associated Diplomates of the National Board of Medical Examiners will hold their annual meeting at luncheon, June 24, at the Palmer House, Chicago.

**Obstetric-Gynecologic Societies Meeting.**— The next meeting of the board of governors of the National Federation of Obstetric-Gynecologic Societies will be held in Chicago at the Palmer House June 25 at noon.

**Society Election.**—The American Broncho-Esophagological Association, at their annual meeting in Atlantic City, N.J., April 7-8, elected Dr. Paul H. Hollinger, Chicago, president, and Dr. Edwin N. Broyles, Baltimore, secretary.

**Tufts Alumni Meeting.**—The Tufts Medical Alumni Association will hold a dinner meeting in Chicago, June 23, at the Windermere East Hotel, 56th Street and Hyde Park Boulevard. Dr. Harry A. Olin, Chicago, is local chairman, while Dr. John F. Conlin, Boston, is the chairman.

**First Annual Meeting of General Practitioners.**—The first annual meeting of the congress of delegates of the American Academy of General Practice will be held in the Sheraton Hotel, Chicago, on June 21. Dr. Paul A. Davis, Akron, Ohio, president, will preside.

**Rocky Mountain Medical Conference.**—August 2-4, 1949 has been selected for the next meeting of the Rocky Mountain Medical Conference to be held in Butte, Mont. The conference, purely scientific, includes the states of Colorado, Montana, New Mexico, Utah and Wyoming and meets biennially in the odd numbered years, rotating its meeting place among the five participating states.

**International Congress.**—The first International Congress of Physiology and Pathology of Animal Reproduction and of Artificial Insemination will be held June 21-30 in Milan, Italy. Seventeen lectures will be read and more than two hundred papers have been sent to the secretary general for discussion. All subscriptions are accepted by the secretary general of the congress in Via Bronzetti 17, Milan, Italy.

**End of the Rosenwald Fund.**—The Julius Rosenwald Fund, founded October 30, 1917, will close its work June 30, having fulfilled the instructions of Rosenwald to spend the principal as well as the interest by that date. It has sought, among other things, to equalize health facilities, aiding health services for Negroes, providing clinics for persons of moderate means and promoting health insurance.

**Graduate Course in Thoracic Diseases.**—The American Trudeau Society has arranged its second graduate course in thoracic diseases to be sponsored by the University of Colorado School of Medicine, Denver, July 19-31. The course is open to forty physicians from Arizona, Colorado, Kansas, Montana, Nebraska, New Mexico, North Dakota, South Dakota, Utah and Wyoming. The course will be under the direction of Drs. James J. Waring and H. Dumont Clark, Denver.

**Alumni Dinner.**—The Association of the Alumni, College of Physicians and Surgeons, Columbia University, is sponsoring a dinner in the Normandie Lounge of the Hotel Stevens, Chicago, June 23 at 7 p.m. Professor Thomas H. Davies of the University of Chicago and the Institute of Nuclear Physics will speak on "The Use of Isotopes in Biological Research." Checks for tickets should be made out to Dr. Donald G. Anderson, Treasurer, c/o the American Medical Association, 535 N. Dearborn St., Chicago 10.

**Dr. Longcope Receives Medal.**—The George M. Kober Medal of the Association of American Physicians was awarded to Dr. Warfield T. Longcope, Lee, Mass., formerly professor of medicine at John Hopkins University School of Medicine, Baltimore, for his contribution to medicine and medical education. The award was made at the society's annual meeting in Atlantic City, N.J., in May. Dr. Francis G. Blake, New Haven, Conn., was elected president; Dr. Walter Bauer, Boston, treasurer, and Dr. Henry M. Thomas Jr., Baltimore, secretary.

**Reports on Psychiatry Advances.**—The Group for Advancement of Psychiatry has prepared reports on shock therapy, the psychiatric social worker in in the psychiatric hospital, medical education, commitment procedures and public psychiatric hospitals. One copy of any report is available to any professional person on request, and additional copies may be secured from the Chairman of the Group for Advancement of Psychiatry, 3617 West 6th Street, Topeka, Kan., at 10 cents a copy, plus postage.

**Medical Military Reunions.**—Officers stationed at O'Reilly General Hospital during the war will hold a reunion at the Palmer House, Chicago, on June 25. Details will be available at the registration desk. The officers stationed at the Ashford General Hospital will have a reunion at the Knickerbocker Hotel, Chicago, on June 22. A reunion dinner for the medical and dental officers of the Fourth Infantry Division (Ivy Leaf Division) and their guests will be held in private dining room 14 of the Palmer House at 7:30 p.m., June 25.

**Pediatric Seminar.**—The Southern Pediatric Seminar, a graduate summer course in methods of diagnosis, prevention and treatment of diseases of children, will be held at Saluda, N.C., July 5-17, with Dr. Samuel F. Ravenel, Greensboro, N.C., dean. The course is designed to fit the needs of the general practitioner. Lecturers represent some of the outstanding pediatrists in the South who volunteer their services. There will be clinics, conferences, round table discussions and lectures on allergy, bronchitis, child behavior, tuberculosis, infant feeding, rheumatic fever, convulsion, diarrhea, obstetrics and poliomyelitis.

**American Radium Society.**—The semicentennial of the discovery of radium will be observed by the American Radium Society at the annual meeting June 20-22, in the Hotel Stevens, Chicago. Foreign guests who will participate in the program include: Francois Baclesse, Paris; Juliette Baude, Paris, Elis Berven, Stockholm; Sir Stanford Cade, B. W. Windeyer, and Constance Wood, London; Robert McWhirter, Edinburgh, and Paul Lamarque, Montpellier, France. The annual Janeway Lecture will be delivered by Sir Stanford Cade at 4:30 p.m., Monday, on "The Achievement of Radium in the Fight Against Cancer." The banquet will be at 7 p.m. Edith H. Quimby, Sc.D., New York, will speak on "Discovery of Radium."

## Marriages

LIPHUS O. MURPHY Jr., Laurel, Miss., to Miss Margaret Massa of Hazelhurst March 19.

WALTER LEE BOURLAND, Memphis, Tenn., to Miss Martha Tom Wright of Paris, Tenn., March 26.

LILLARD F. BEASLEY to Miss Jane Wyatt, both of Franklin, Ky., February 22.

JOSEPH I. GARCIA Jr., Memphis, Tenn., to Miss Mary Jane Quinn of Ducktown March 16.

PHILIP C. HENNESSEE, Portland, Ind., to Miss Donna Lee of Bedford in Indianapolis February 7.

## Deaths

**Edward Arthur Balloch** ● Washington, D. C.; born in Somersworth, N. H., Jan. 2, 1857; Howard University College of Medicine, Washington, 1879; dean emeritus at his alma mater, where he served as professor of principles and practice of surgery and clinical surgery; past president of the Medical Society of the District of Columbia; fellow and founder member of the American College of Surgeons; during World War I active as medical consultant on local draft boards; for many years affiliated with the Freedmen's Hospital; in 1929 received the degree of doctor of science and was presented a testimonial bronze tablet by Howard University; received the Howard University Annual Award for distinguished postgraduate achievement; died March 2, aged 91, of cerebral thrombosis.

**Reuben Adolphus MacBrayer** ● Southern Pines, N.C.; born in Asheville, N.C., Nov. 26, 1892 University of Pennsylvania School of Medicine, Philadelphia, 1916; member of the Medical Society of New Jersey; on active duty as a medical officer in the U. S. Army in Mexico prior to World War I; served during World Wars I and II; formerly medical director, Ciba Pharmaceutical Products, Inc., at Summit, N.J., where during the same period he was consultant in endocrinology and associate in pathology for the Overlook Hospital; at one time on the staff of the North Carolina Sanatorium for the Treatment of Tuberculosis in Sanatorium; member of the Association of Military Surgeons of the United States; died February 21, aged 55, of coronary thrombosis.

**Charles Harold Avent**, Memphis, Tenn.; born in Kerens, Texas, June 10, 1908; University of Tennessee College of Medicine, Memphis, 1932; member of the American Medical Association and the Southeastern Surgical Congress; fellow of the American College of Surgeons; on the faculty of his alma mater; in June 1942 entered the medical corps, Army of the United States, as a captain; service terminated with rank of lieutenant colonel in November 1945; chief surgeon for an evacuation hospital; awarded the Bronze Star for meritorious service in Belgium; affiliated with the John Gaston Hospital and the Baptist Hospital, where he died February 15, aged 39, of hypertension.

**Samuel Heberman** ● Malden, Mass.; born Nov. 13, 1882; George Washington University School of Medicine, Washington, D. C., 1907; for many years physician in charge of the tuberculosis clinic of the board of health; member of the American Trudeau Society; past president of the Malden Tuberculosis and Health Association; affiliated with the Malden Hospital; served as chief of the pulmonary clinic at Beth Israel Hospital, Boston; died February 18, aged 65, of carcinoma of the colon, hypertension and cerebral hemorrhage.

**Samuel Humes Watson** ● Tucson, Ariz.; Rush Medical College, Chicago, 1899; past president of the Arizona State Medical Association and the Benton County (Ia.) Medical Society; fellow of the American College of Physicians; member of the American College of Chest Physicians and of the American Association for the Study of Allergy; specialist certified by the American Board of Internal Medicine; affiliated with the Barfield Sanatorium and St. Mary's Hospital and Sanatorium; died February 5, aged 70, of cerebral hemorrhage.

**Charles Percy Aling**, Minneapolis; Rush Medical College, Chicago, 1900; member of the American Medical Association; member of the staff of St. Barnabas Hospital; died January 16, aged 69, of coronary disease.

**Robert Bruce Bainter**, Zanesville, Ohio; Baltimore Medical College, 1893; member of the American Medical Association; affiliated with Bethesda Hospital and Good Samaritan Hospital, where he died January 20, aged 81, of fracture of the hip.

**Edward Williams Barton**, San Gabriel, Calif.; Medical College of Ohio, Cincinnati, 1901; served during World War I; died February 5, aged 73, of cerebral hemorrhage.

**Jewell Lee Bass**, Carbondale, Ill.; University of Illinois College of Medicine, Chicago, 1931; died in the Holden Hospital January 11, aged 45, of hepatic cirrhosis.

**Tilman Carlisle Britt**, Mount Airy, N.C.; Jefferson Medical College of Philadelphia, 1921; member of the American Medical Association; served as health officer of Surry County and of Wilmington, N.C.; died in Sanford, Fla., February 20, aged 53, of hypertension and coronary thrombosis.

**James Forest Buchanan**, Dallas, Texas; Baylor University College of Medicine, Dallas, 1927; member of the American Medical Association; died January 24, aged 51.

**William Henry Burns** ● Alliance, Ohio; Cleveland Homeopathic Medical College, 1902; for many years served as health commissioner of Alliance and on the board of health; died January 20, aged 69.

**Charles P. Carlisle**, Dallas Texas; Gate City Medical College, Dallas, 1906; member of the American Medical Association; died January 19, aged 73.

**Charles Cox Chapin**, Lafayette, Ind.; College of Physicians and Surgeons, Los Angeles, 1918; member of the American Medical Association; served during World War I; medical director of Wabash Valley Sanitarium; formerly superintendent of Logansport State Hospital in Logansport; died in Home Hospital February 26, aged 55, of organic heart disease.

**Alfred B. Claytor**, Bedford, Va.; University of Pennsylvania Department of Medicine, Philadelphia, 1894; member of the American Medical Association; died January 9, aged 79, of pneumonia.

**George McClave Cultra**, Amarillo, Texas; University of Nebraska College of Medicine, Omaha, 1919; specialist certified by the American Board of Pediatrics; fellow of the American College of Physicians; on the staffs of the Northwest Texas and St. Anthony's hospitals, died January 4, aged 53, of cerebral hemorrhage.

**Tommaso D'Alessio**, South Plainfield, N.J.; Regia Università di Napoli Facoltà di Medicina e Chirurgia, Italy, 1916; decorated for his gallantry during World War I; died February 27, aged 65, of coronary thrombosis and diabetes mellitus.

**William A. Davis**, Austin, Texas; Missouri Medical College, St. Louis, 1899; for many years state registrar of vital statistics; fellow of the American Public Health Association; formerly health officer of Fort Worth; for two terms president of the American Association of State Registration Executives; died January 27, aged 74, of myocarditis and gastric hemorrhage.

**Eva A. Corell Dittmann**, Cashmere, Wash.; Cleveland University of Medicine and Surgery, 1896; died January 17, aged 93, of coronary thrombosis.

**Leland Pride Durant**, Paso Robles, Calif.; Tulane University of Louisiana School of Medicine, New Orleans, 1942; interned at Charity Hospital in New Orleans; served a residency at Monterey County Hospital in Salinas; an officer in the medical corps of the U. S. Naval Reserve during World War II; died January 8, aged 32, of uremia and bilateral ureteral kink.

Edgar McDonell Griffith, Harrisonville, Mo.; University Medical College of Kansas City, 1911; member of the American Medical Association; director of the Cass County Health Unit; an officer serving overseas during World War I; served as county coroner and county physician; on the staffs of Menorah Hospital in Kansas City and Memorial Hospital; died February 21, aged 63, of coronary occlusion

Oscar Louis Harries, Buffalo; University of Buffalo School of Medicine, 1898; died February 22, aged 89, of fracture of neck of the femur received in fall.

James G. Harrison, McAllen, Texas, Louisville (Ky.) Medical College, 1896; died January 18, aged 74.

Joseph Jefferson Henderson, San Francisco; University of Michigan Department of Medicine and Surgery, Ann Arbor, 1891; member of the American Medical Association; died January 9, aged 77, of carcinoma of the stomach.

William Elijah Hicks, Timmonsville, S. C.; Medical College of the State of South Carolina, Charleston, 1909; member of the American Medical Association; died in Florence February 8, aged 66.

Julius Albin Hupert, Washington, D. C.; University of Lemberg, Austria, 1902; died February 8, aged 71, of heart disease.

John Wesley Hutchens ● Portsmouth, Ohio; Miami Medical College, Cincinnati, 1905; served as health officer; on the physicians' and surgeons' staff of the Norfolk & Western, Chesapeake & Ohio and Baltimore & Ohio railways; died January 13, aged 64.

Ben Terrell Johnson, Bluffton, Ga.; Atlanta School of Medicine, 1912, died January 19, aged 59.

Willis H. Kimball, San Diego, Calif.; Medical School of Maine, Portland, 1891; died February 15, aged 81.

Joseph Davis Lehman, Philadelphia; Jefferson Medical College of Philadelphia, 1902; also a graduate in pharmacy; member of the American Medical Association; at one time on the faculty of his alma mater; for many years physician for the board of health and chief of staff at Memorial Hospital; died February 22, aged 74.

John Lawrence Lund, Perth Amboy, N.J.; Long Island College Hospital, Brooklyn, 1891; on the local board of health for one term; formerly city physician; during World War I served as a captain in the medical corps of the U. S. Army; formerly on the staff of Perth Amboy General Hospital; died February 21, aged 80, of heart disease.

James Donald McKay ● Marion, Ind.; Trinity Medical College, Toronto, Canada, 1895; served on the staffs of the Marion General and Veterans Administration hospitals; died February 18, aged 78, of coronary occlusion.

John F. McMath, Americus, Ga.; University of Georgia Medical Department, Augusta, 1889; died January 28, aged 92.

Grace Milliken, Dedham, Mass.; Tufts College Medical School, Boston, 1926; member of the American Medical Association; died in the New England Hospital for Women and Children in Boston, January 19, aged 74, of probable pulmonary embolism and a fractured hip received in an accident.

Robert Edgar Mitchell, Richmond, Va.; Medical College of Virginia, Richmond, 1913; also a graduate in pharmacy; member of the American Medical Association and of the Richmond Academy of Medicine; affiliated with the Medical College of Virginia Hospital, Johnston-Willis Hospital and the Stuart Circle Hospital; died February 21, aged 63, of cerebral hemorrhage.

James Hunt O'Conner, San Francisco; Cooper Medical College, San Francisco, 1895; member of the American Medical Association; fellow of the American College of Surgeons; formerly chief surgeon for the Market Street Railway; served on the staff of St. Francis Hospital; for many years on the staff of the Southern Pacific Hospital, where he died February 2, aged 78.

Thomas Hunt O'Connor ● San Francisco; Cooper Medical College, San Francisco, 1908; also a graduate in pharmacy; in 1933 elected to the board of trustees of St. Francis Hospital, where during the past eight years he served as first vice president and chief of the department of surgery; died February 4, aged 67, of cerebral hemorrhage.

Gustaf Adolf Oredson, Hoquiam, Wash.; College of Medical Evangelists, Loma Linda and Los Angeles, 1938; member of the American Medical Association and of the California Medical Association; certified by the National Board of Medical Examiners; served overseas during World War II; affiliated with St. Joseph Hospital in Aberdeen; died February 15, aged 37, of heart disease.

Henry Leon Picard, Philadelphia; Jefferson Medical College of Philadelphia, 1896; served on the staffs of the Lankenau, St. Mary's and Jefferson hospitals; died January 15, aged 72.

Hardell Yates Pope ● Monticello, Ark.; Jefferson Medical College of Philadelphia, 1893; an Affiliate Fellow of the American Medical Association; served during World War I; died January 22, aged 78 of myocarditis.

Anthony Domenico Semisa, New York; New York Homeopathic Medical College and Flower Hospital, New York, 1913; member of the American Medical Association; died January 8, aged 63.

Furman Thomas Simpson, Westminster, S. C.; University of Maryland School of Medicine, Baltimore, 1909; member of the American Medical Association; veteran of World War I; served as chairman of the local board of health and as county health officer; died January 29, aged 65, of heart disease.

Arthur Bushnell Smith, San Diego, Calif.; Cleveland University of Medicine and Surgery, 1897; specialist certified by the American Board of Radiology, Inc.; member of the Radiological Society of North America, Inc., and of the American College of Radiology; died January 11, aged 74, of uremia, nephritis and chronic prostatitis.

Anthony Edward Sojewicz, Syracuse, N.Y.; Syracuse University College of Medicine, 1934; member of the American Medical Association; served during World War II; on the staff of Onondaga General Hospital, where he died February 10, aged 39, of cerebral hemorrhage.

Harol Steele, St. Louis; Universidad Nacional Facultad de Medicina, Mexico, D. F., 1941; member of the American Medical Association; on the staff of Missouri Pacific Hospital, where he died February 5, aged 44, of heart disease.

Eunice Rand Stoops, Oakland, Calif.; American Medical Missionary College, Battle Creek and Chicago, 1902; died January 26, aged 71.

Benjamin Lansing Ten Eyck ● Major, U. S. Army, retired, New Rochelle, N.Y.; College of Physicians and Surgeons, medical department of Columbia College, New York, 1885; served in the U. S. Army from 1889 to 1903, when he was retired for disability; veteran of the Spanish-American War; died February 4, aged 85, of arteriosclerosis.

Edith Rebecca Hornberger Wolf, Lakeland, Fla.; Cleveland University of Medicine and Surgery, 1896; formerly a medical missionary in Africa; died February 10, aged 76.

# Foreign Letters

## PARIS

*(From Our Regular Correspondent)*

April 15, 1948.

### Tetraethylammonium as Regulator of Vegetative Nervous System

Professors C. Lian and G. Bergamo have obtained fairly lasting results in the treatment of arterial hypertension, angina pectoris, Raynaud's Disease and arteritis obliterans by tetraethylammonium; contrary to other reports, uncomfortable reactions to this drug were infrequent. Five cubic centimeter ampules of tetraethylammonium in a 10 per cent solution were used intramuscularly and often associated with a substance prolonging the drug's action: "subtosan" (polyvinyl pyrrolindina) in 25 per cent solution. The authors found that tetraethylammonium is a great regulator of the vegetative nervous system: the injection of this drug in an animal anesthetized by morphine initiates an acceleration of the cardiac frequency up to the normal; to the contrary, in an animal anesthetized with barbiturates an injection slows the heartbeat to normal. The effect remains the same when the modifications of the cardiac rhythm have been obtained by the preganglionic excitation of the cardiac nerves. The authors have employed this drug in human beings also and reported their results to the "Societe Medicale des Hopitaux de Paris," April 9, 1948. In a young woman with tachycardia due to sympathetic hypertonia the intravenous injection of one ampule of the drug for a few days progressively diminished the pulse rate from 140 to 80 a minute, in another case from 130 to 110. Inversely, in 2 asthmatic and brachycardiac patients repeated injections of the drug induced a progressive acceleration of the pulse: in the first case from 58 to 75, in the second from 60 to 72. In several vagotonic patients they observed that the slowing down of the heart, initiated by compressing the eyeball does not occur after a previous injection of one ampule of this drug; inversely, in sympatheticotonic patients the same process caused, after injection of one ampule, a normal slowing down of the cardiac frequency. In 1 patient in whom intensive ephedrine therapy had no effect on frequent pauses of the heart due to sinoauricular block, the intravenous injection of one ampule of tetraethylammonium caused the block to disappear and the rhythm to increase from 38 to 65 pulsations; however, forty-five minutes after the injection the intermittent block and bradycardia reappeared. The authors are of the opinion that this drug would have a favorable effect against acute edema of the lung.

### A Study of Delinquent Children

Dr. M. Heuyer has made a study of the influence of the war and the period of occupation on the psychology of children. The intellectual level of children has not been impaired by war, and mental debility has not increased. The author made these conclusions following a census of abnormal children, begun in 1937 and pursued during the war. The study was based on the Gilles nonverbal test and comprised the mental analysis of 100,000 children of twenty-five different regions. The educational level, which had fallen during the war, has again risen to the prewar level. The number of vagabond children entrusted to private institutions has risen from 492 in 1938 to 2,505 in 1944. Children's gangs have been rare in France. The number of underage offenders appearing before the courts for the whole of France increased from 11,788 in 1937 to 32,100 in 1943 and diminished to 11,800 in 1945. This increase in juvenile deliquency in the proportion of 1 to 3 or 4, till 1943 was found in all countries of Europe which had to endure war and occupation, even in Switzerland.

### Miscellaneous

The French Society of Phlebology has just been officially organized. It brings together specialists and those who are interested in the study and treatment of diseases of the veins.

From June 24 to 27 the second International Scientific Conference will take place at Aix-les-Bains under the honorary presidency of Professor Besancon and the presidency of Professor Leriche. The principal subject on the agenda is degenerative chronic rheumatism. For full information apply to Dr. Francon, 55 Rue des Mathurins, Paris, 9.

## ITALY

*(From Our Regular Correspondent)*

April 7, 1948.

### Surgery of the Spleen

A recent meeting of the Surgical and Medical Association of Naples was devoted to surgery of the spleen. Signorelli reported the case of a girl aged 12 years with abdominal syndrome characterized by attacks of painful splenomegaly, rise of temperature, transitory ascites, small liver and positive reaction to the Takata-Ara test. Splenectomy revealed congestive splenomegaly with numerous hemorrhagic intrasplenic foci and annular cirrhosis of the liver. Eight months after the operation the patient was in good health. Signorelli presented also the history of a girl aged 16 with brucellosis of five months' duration; she had undulatory high fever, enlarged spleen and liver, rapid anemization and hemorrhagic manifestations. After two months of ineffective vaccinotherapy, splenectomy was performed and was followed by rapid improvement of the hepatic condition and normal temperature. Microscopic examination of the spleen and biopsy of the liver revealed a congestive hemorrhagic splenitis and an acute hepatitis. The speaker attributed the main responsibility for the clinical aspect to the hepatitis with a vicious circle of chainlike damage (liver-spleen-bone marrow-liver) which may be interrupted only by the removal of the spleen.

Torraca discussed several cases of splenectomy performed for various indications: congestive splenomegaly, Banti's disease, cirrhosis of liver, hemorrhagic purpura, hemolytic icterus, brucellar splenomegaly. The operative course was favorable in all instances.

Late results were satisfactory for months, and in some cases for nine years after the operative intervention. One patient with cirrhosis of liver and splenomegaly died after two years because of recurrence. In 1 patient with Werlhof's disease (thrombopenic purpura) who is still in good health after nine years, the splenectomy had only a transitory effect and the patient had to take vitamin K for a long time.

Perrotti summarized modern concepts of the treatment of splenopathy; he insisted that splenectomy is superior to ligation of the splenic artery.

### Insurance Against Occupational Accidents

An agreement was reached between the National Institute of Insurance Against Occupational Accidents and the National Municipal Medical Association,

with the following decisions:

1. The assistance given persons who had an accident while working includes first aid and treatment up to the time of recovery, prescriptions and occasional reports required by the institute.

2. The institute will pay as much as 500 lire for the complete cure of each person who had an accident while working or who had an occupational disease.

3. In cases of fractures, the physicians as a rule will limit their care to the application of a temporary apparatus of immobilization and to sending the victim as soon as possible to a nearby hospital or to the Surgical Ambulatorium of the of the institute. A fee of 400 lire will be paid to the physician for the application of any apparatus of immobilization.

## BRAZIL

*(From Our Regular Correspondent)*

Buenos Aires, March 1, 1948

### Surgical Drainage of the Cardiac Lung

To find a surgical treatment for some diseases of the heart which until now have been in the exclusive domain of internal medicine, Drs. Pedro Cossio and I. Perianes of Bueno Aires have performed for almost a year different surgical procedures in animals. These involved more or less risk, and some of them were more physiologic than others. All have been performed to drain the cardiac lung and thereby to alleviate a group of symptoms which burden exceedingly patients with this condition. After having acquired enough experience with animals they carried out the tricuspid valvotomy in men. The technic consists in dissecting the vena jugularis interna and introducing the valvulotome, which the same authors have described. Afterward the vein is sewed again.

Three patients survived in good condition and continue to live in relatively good health. All three manifested an increase of the vital capacity and of the time of apnea, with diminution of the dyspnea. A fourth patient (a woman) died, probably by paroxysmal auricular fibrillation, from which she had suffered before the valvotomy. She had vomiting and complete aphonia, followed quickly by acute edema of the lung (the patient had mitral stenosis).

It is not possible, of course, to judge the therapeutic value of the operation, although the results are apparently encouraging. The cases are few, and it is known that in cardiology the most unexpected evolutions in the most desperate conditions may occur. Furthermore, the same authors are experimenting on a new way to discharge the cardiac lung by means of an anastomosis of the left vena or arteria pulmonalis inferior with the vena splenica. In this way the blood can avoid the obstacle which would signify a mitral stenosis or an insufficiency of the left ventricle; it returns to the right heart after having passed through a considerable distance. Thus there is no great probability that the right ventricle will get rapidly overcharged as it would, for example, when an anastomosis (vena pulmonalis -azygos- cava superior) had been made.

### The Ample Sympathectomy in Primary Hypertension

To the same society Professors Tibrucio Padilla and Pedro Cossio and Drs. Julio A. Berreta and and G.H. Alvarez reported their experiences with splanchnicectomy and postganglionic sympathectomy, ample and bilateral (lumbar or dorsolumbar), which they performed in 34 cases of primary hypertension at the medical clinic of the University of Buenos Aires. The age of the patients varied between 29 and 50 years, only 1 of them was 52, three others were 54 years of age. All except 2 who are not mentioned in the statistics had relatively good renal sufficiency. All showed a good lability of tension; 18 had a cardiopathic condition of different degree. The mortality rate was 9.09 per cent. Although the figure of arterial tension improved immediately after the operation in 50 per cent of patients the percentage decreased rapidly with the course of time, so that after six to twenty-four months only some 17 per cent of the persons operated on were still benefited. The hypertensive condition improved immediately after the operation in nearly all cases, but with time ventricular surcharge and enlargement of the heart reappeared, until the earlier grade was reached or even passed. On the other hand, in some cases the improvement of cardiac insufficiency persisted during a longer period. It is not possible to make an accurate prognosis of the efficiency of the operation, even though the patient's age, the results of the sedative and cold tests and the degree of hypertension are known.

This procedure must be considered as a radical therapeutic step which may be taken in exceptional circumstances, perhaps in rapidly progressing hypertension after all other therapeutic means have failed and in hypertensive cardiopathy (third degree) when the treatment only partly controls the cardiac insufficiency, provided that the patients are under 50 years of age and have good renal suffigiency.

### Pan-American Congress of Gastroenterology

The Pan-American Congress of Gastroenterology will be held from March 11 to 17, 1948 in Buenos Aires, under the chairmanship of Professor Carlos Bonorino Udaondo. The main subject will be "Chronic Cholecystitis Without Stones." The different aspects of the theme will be considered by Drs. B.B. Crohn, New York; H.L. Bockus, Philadelphia; C. Bonorino Udaondo, Buenos Aires; Ignacio Chavez, Mexico; Robert Elman, St. Louis; A.C. Broders, Rochester, Minn; Domingo Mosto, Buenos Aires; Pedro A. Barcia, Montevideo, Uruguay; Pedro A Maissa, Buenos Aires; B. Varela Fuentes, Montevideo; A. López Garcia, Buenos Aires; Julio Carrere, Montevideo; Pablo Mirizzi, Cordoba, Argentina; Marcelo Royer, Buenos Aires; A. da Silva Mello, Rio de Janeiro; Alfonso Uribe-Uribe, Bogota, Colombia; Hernán Alessandri, Santiago, Chile; Norberto M. Stapler, Buenos Aires; Félix Amesti, Santiago, Chile; Fortunato Quesada, Lima, Peru; Abraham Ayala González, Mexico, and Adrian J. Bengolea, Buenos Aires. For information address the secretary, Tucuman 1978, Buenos Aires.

### Congress of Dermatology

With Professor Pedro L. Baliño, president of the Argentine Association of Dermatology and Syphilology, in the chair, the meeting held in Buenos Aires received great assistance from specialists and several foreign guests, among others Professor José Gay Prieto, president of the Spanish Academy of Dermatology, Madrid, Dr. Arthur Grace (Long Island, N.Y.), Dr. Max Wolf (New York) and well known specialists of Brazil, Chile, Uruguay and Spain. The deliberations were held in three sections: (1) dermatology--the treatment of lupus and other cutaneous tuberculids with the method of Charpy (France), the Besnier-Boeck-Schaumann disease and lupus erythematosus; (2) syphilis-intensive treatment of recent syphilis, and (3) lepra--prophylaxis and treatment with modern methods; their practical application.

From the many subjects treated we may refer here only to the fact that it was the unanimous

opinion that there is no tuberculosis causation of lupus erythematosus, which has to be considered as a syndrome in which focal infection, particularly by streptococci, plays an important role and further exterior factors, especially sunlight, participate.

## BERLIN

*(From Our Regular Correspondent)*

Wiesbaden, April 25, 1948.

### Venereal Disease Control Legislation in Germany

Next to the fight against tuberculosis the combating of venereal disease is the most important public health problem in Germany today. This has been recognized by the Allied Control Council, the quadripartite government of Germany, the existence of which is presently the subject of worldwide political discussions.

In a recent draft law, published as an appendix to Control Council Directive 52, the Control Council, "taking into consideration the increasing incidence of venereal disease among the German population and in the interest of health conditions in Germany," adopted a uniform plan and procedure in all the zones of occupation of Germany for the fight against venereal disease among the German population.

### Control Council Directive 52

On May 7, 1947, the Allied Control Council, "disturbed by the increased incidence of cases of venereal disease and convinced that one of the causes of this increase lies in the ineffectiveness of the German law at present in force," issued Directive 52, which was designed to combat venereal disease more effectively. This directive imposed on the zone commanders in the four zones of occupation in Germany the duty to examine existing legislation for the control of venereal disease among the German population, whereby particular attention is to be directed to the following points: *(a)* "To determine whether the laws and decrees dealing with the instruction of the people on the control of venereal disease are adequate; *(b)* to achieve uniformity in the detection of cases of venereal disease, the compulsory declaration of such cases to the appropriate authorities and the establishment of isolation wards for treatment of such infections."

To this directive was attached the text of a draft law "Relative to Combating Venereal Disease" and two draft directives, one "On the Enforcement of the Law Relative to Combating Venereal Disease," the other "Establishing Venereologic Diagnostic Centers and Isolation Wards." These constitute the policy of the Allies in this matter and were designed to give guidance to the zone commanders in order to make possible uniform venereal disease control measures throughout the four zones of occupation. The zone commanders were directed to encourage legislation in their zones as nearly in conformity with the draft law and the two draft directives as possible. The following is a short summary of the main provisions contained in this draft legislation on venereal disease, as compared with the German legislation of 1927:

The term venereal disease, as applied in Directive 52, now includes also Nicolas Favre disease (lymphogranuloma venereum and lymphopathia venerea). The draft law provides for the abrogation of the German law of 1927 and its implementations and amendments. Under this draft law it is the responsibility of any person knowingly infected with venereal disease or, by reason of circumstances, suspecting himself to be so infected, *(a)* to have himself examined and treated by a licensed physician until fully cured and *(b)* to refrain from sexual intercourse until permission to resume such intercourse is received from the treating physician.

Any pregnant woman who might transmit syphilis congenitally either because she herself is infected with syphilis or because of known syphilis in the procreator has to take the same measures as referred to under sections *a* and *b*. Sexual intercourse by a person with venereal disease in an infectious stage is under the provisions of the draft law punishable without the former requirement of a request for instituting criminal proceedings. The most important changes brought about by the new draft law are in the field of finding the sources and contacts of the infection. While the old law did not encourage the reporting of one person by another, since it provided that no attention be paid to anonymous reports, the new draft law states that all physicians, on diagnosing a new case of venereal disease, will make every effort to obtain from the patient the maximum useful information for identifying and tracing the alleged source and also sexual contacts that may have been infected by the patient. Such information will be related to the public health authorities without delay. The authorities will then immediately take all necessary steps to induce the alleged source, and all sexual contacts who may have been infected, to submit to a medical examination and, if necessary, to compulsory treatment. In the new draft law the immediate hospitalization is to be recommended by the treating physician in cases (1) where the patient is leading a promiscuous sexual life, whether as a prostitute or not; (2) where the patient is subject of a complaint of infection brought by a member of the occupation forces, or (3) has infected, or is suspect of having infected, a member of the occupation forces.

### Subsequent Legislation

On the basis of Control Council Directive 52 and the attached draft law and directives, a law relative to combating venereal disease was passed by the Berlin Kommandatura on Oct. 31, 1947, which is applicable within the city proper. Similarly, on Dec. 11 a law was passed in the Soviet zone of occupation following the pattern of Control Council Directive 52. The differences between these laws and the Control Council draft legislation are only slight and need not be mentioned here. The British Military Government, in its zone, has submitted Control Council Directive 52 and its accompanying draft legislation to the legislative assemblies in the British zone, where the passing of such legislation uniformly and zonewide is under way now. In the American zone of occupation there have been similar debates in the *Laenderrat*. It is to be expected that uniform legislation based on Control Council Directive 52 and its implementation will soon be enacted in both zones.

### Miscellaneous

The German Society for Internal Medicine will meet on May 19, 20 and 21, 1948, in Karlsruhe, American zone. The main topics will be the vegetative nervous system, virus diseases and blood pigment. Professor C.M. Haselmann, director of the dematologic clinic of Erlangen University, has been invited by the Cuban government and by the International Leprosy Association to participate as official delegate in the International Congress for Leprosy at Habana. On Dec. 10, 1947, Dr. Gerhard Domagk received in Stockholm the Nobel prize for the discovery of the therapeutic effects of the sulfonamide drugs. Under the Nazi régime he had been forbidden to accept that award.

# Medical Motion Pictures

## FILM REVIEWS

**Anomalies of the Bile Ducts--Blood Vessels and Strictures of the Common Duct, Part I and II.** 16 mm., color, silent, 1,200 feet (one reel), showing time forty minutes. Prepared in 1947 by Warren H. Cole, M.D., Chicago. Produced by Mervin LaHue for the American College of Surgeons under a grant from the Johnson & Johnson Research Foundation. Procurable on loan from Ethicon Suture Laboratories, Division of Johnson & Johnson, New Brunswick, N.J.

The anomalies of the bile ducts and blood vessels and strictures of the common duct are treated in two parts in this motion picture. Diagrammatic illustrations and animation are used throughout to identify the normal gallbladder and surrounding adjacent organs. The excision of part of the common duct, thus pulling it into the position normally occupied by the cystic duct, is illustrated by drawings. These drawings show the danger of injury to the common duct during cholecystectomy when an unusually large Hartmann's pouch densely adherent to the common duct is encountered. Injury of the duct if hemorrhage is not controlled correctly when ligating the vessels is demonstrated; an accessory bile duct which is severed and not ligated may result in a stricture. Other causes of stricture of the common duct, not related to trauma, are described as diffuse sclerosing pancreatitis, abscess about the duct, ulceration of the wall by stones and suppurative cholangitis. Observation of certain precautions given in the film will be of great value in reducing the incidence of stricture of the common duct. Conditions such as injury or obstruction to the common duct causing a biliary fistula or jaundice developing postoperatively are described clearly.

The various types of strictures such as local stricture, stricture of the distal end, stricture of the proximal end and absence of the entire duct are clearly presented in drawings. However, in most cases the distal end of the common duct is present but is difficult to find because of its position under the duodenum and in the head of the pancreas. Although the original trauma may be limited to a small portion of the duct, the entire duct can be involved by a process known as obliterative cholangitis. In the repair of local strictures metal tubes are used for support at the anastomotic line for at least three months following repair; however, most surgeons insert a T tube with one arm extending beyond the suture line. Procedure for anastomosis of the common duct to the duodenum and the use of the Roux y-arm of jejunum with the use of metal tubes for a support or the use of the rubber catheter are clearly demonstrated. The incidence of congenital atresias are mentioned, namely: hepatic duct patent, atresia of extrahepatic ducts (7 per cent), atresia of hepatic duct, cystic duct and common duct normal (11 per cent), hepatic and proximal portion of common duct patent (14 per cent) and atresia of all extrahepatic ducts (70 per cent).

The film is brought to a conclusion by summarizing the following facts which were emphasized throughout: During operation avoid trauma, carelessness and haste; be on the alert for anomalies, and have thorough knowledge of normal anatomy in the region of the gallbladder. Well prepared, still drawings constitute the majority of illustrations in this picture. However, various camera methods were used to give the illusion of motion. If sound slide film projectors were more readily available in medical schools and hospitals, the production of a film strip instead of a motion picture might have been considered. This is an excellent educational technical film, since it points out the anatomic relationships of the biliary passages. It can be recommended for showing to groups of general surgeons, interns and possibly senior medical students.

# Medical Examinations and Licensure

## COMING EXAMINATIONS AND MEETINGS

### BOARD OF MEDICAL EXAMINERS
### BOARDS OF EXAMINERS IN THE BASIC SCIENCES

Examinations of the boards of medical examiners and boards of examiners in the basic sciences were published in THE JOURNAL, May 29, page 487.

### NATIONAL BOARD OF MEDICAL EXAMINERS

National Board of Medical Examiners: Parts I & II Various centers, Sept. 13-15. Final date for filing application is Aug. 13. Exec. Sec., Mr. Everett S. Elwood, 225 South 15th St., Philadelphia 2.

### EXAMINING BOARDS IN SPECIALTIES

American Board of Anesthesiology: Written, Various Centers, July 16. Oral, Philadelphia, Oct. 19. Sec., Dr. Paul M. Wood, 745 Fifth Ave., New York 22.

American Board of Dermatology & Syphilology: Oral. Groups A & B. Ann Arbor, Oct. 21-23. Final date for filing application is Aug. 2, 1949. Written. Ann Arbor, Sept. 9. Sec., Dr. C. W. Lovis. 66 E. 66th St., New York 21.

American Board of Neurological Surgery: Oral. Chicago. June 1949. Final date for filing application is Jan. 1949. Sec., Dr. W. J. German. 310 Cedar Street, New Haven, Conn.

American Board of Obstetrics and Gynecology: Part I. Various Centers, Feb. 4, 1949. Final date for filing Application is Nov. 1. Sec., Dr. Paul Titus, 1015 Highland Bldg., Pittsburgh 1.

American Board of Ophthalmology: Oral. Chicago, Oct. 6. Written. Various centers, Jan. 1949. Final date for filing application is July 1, 1949. Sec., Dr. S. Judd Beach, 56 Ivie Rd., Cape Cottage, Maine.

American Board of Orthopedic Surgery: Part II. Chicago. January 1949. Final date for filing application is August 15. Sec., Dr. Francis M. McKeever, 1136 W. 6th St. Los Angles 14.

American Board of Otolaryngology: Oral. Chicago, June 15-19. Sec., Dr. D. M. Lierle, University Hospital, Iowa City.

American Board of Pathology: Chicago, Oct. 8-9. Final date for filing application is Oct. 1. Sec., Dr. Robert A. Moore, 597 Euclid Ave., St. Louis.

American Board of Pediatrics: Chicago, June 25-27. Seattle, Sept 10 12. Atlantic City, Nov. 17-19. Written. July 30. Sec., Dr. Lee F. Hill, 718 Royal Union Bldg., Des Moines, Iowa.

American Board of Plastic Surgery: Examinations are given in June and November of each year in the hometown of applicants. Sec.-Treas., Dr. Louis T. Byars, 400 Metropolitan Bldg., St. Louis.

American Board of Psychiatry and Neurology: Oral. All Groups, San Francisco, October. Final date for filing application is July 15. Sec., Dr. F. J. Braceland, 102-110 Second Ave., S. W., Rochester, Minn.

American Board of Radiology: Nov. Final date for filing application is Sept. 1. Sec., Dr. B. R. Kirklin, 102-110 Second Ave., S. W. Rochester, Minn.

American Board of Surgery: Written. Part I. Oct. Final date for filing application is July 1. Sec., Dr. J. S. Rodman, 225 S. 15th St., Philadelphia.

American Board of Urology: Chicago, Feb. 12-16, 1949. Final date for filing application is Sept. 1. Sec., Dr. Harry Culver. Route 813, Sunnyside Rd., Minneapolis 4.

# Current Medical Literature

## AMERICAN

The Association library lends periodicals to members of the Association and to individual subscribers in continental United States and Canada for a period of three days. Three journals may be borrowed at a time. Periodicals are available from 1937 to date. Requests for issues of earlier date cannot be filled. Requests should be accompanied with stamps to cover postage (6 cents if one and 18 cents if three periodicals are requested). Periodicals published by the American Medical Association are not available for lending but can be supplied on purchase order. Reprints as a rule are the property of authors and can be obtained for permanent possession only from them.

Titles marked with an asterisk (*) are abstracted below.

### Bull. of U.S. Army Med. Dept., Washington, D.C.

8:81-164 (Feb.) 1948

Anopheles Gambiae Problem in Brazil and West Africa, 1941-1946. E. Farrell.—p. 110.
Coccidioidal Infection. F. W. McLaughlin.—p. 124.
Studies on Schistosomiasis: II. Summary of Further Studies on Methods of Recovering Eggs of S. Japonicum from Stools. G. W. Hunter 3d, E. P. Hodges, W. G. Johnson and others.—p. 128.
*Tuberculous Pleurisy with Effusion. I. G. Karron and R. K. Purves.—p. 131.
Clinical Aspects of Protein Metabolism. Co. Tui.—p. 136.
Clinical Importance of Rh Factor. P. Levine.—p. 139.
Diagnosis and Treatment of Essential Hypertension. J. Rodish.—p. 146.
Surgery of Hypertension. B. S. Ray.—p. 151.

**Tuberculous Pleurisy with Effusion.**—Karron and Purves present observations on 215 cases of tuberculous pleurisy with effusion. Cases of pleurisy secondary to pneumothorax are not included. This is a select group, since it consists only of male American soldiers hospitalized at one of the Army tuberculosis centers. The great majority of these soldiers were transferred from other Army hospitals. The past histories revealed that 12 per cent of the patients had close contact with an open case of tuberculosis in civil life. In addition, 11 per cent were liberated prisoners of war, most of whom were exposed to cases of tuberculosis, giving a combined contact history in 23 per cent. Commenting on the pathogenesis, the authors say that it has been suggested that pleural effusions result from the rupture of a caseous tuberculous hilar node into the pleural cavity, either directly or through a small zone of intervening lung that has been consolidated by periadenitis. In this group, however, hilar adenopathy was present in less than 1 per cent of the cases. Parenchymal disease was present in 42 per cent of this group of 215 patients. Dissemination occurred in 16 per cent during the six to twelve month period of observation.

### Hawaii Medical Journal, Honolulu

7:193-270 (Jan.-Feb.) 1948

Law Relating to Medico-Legal Autopsies in Territory of Hawaii. A. V. Hajosha.—p. 205.
Familial Erythroblastic Anemia (Cooley's Anemia): Report of Possible Cases in 2 Filipino Brothers. E. F. Slaten.—p. 210.
Incidence of Oxyuriasis Among Group of School Children in Honolulu. J. E. Alicata and Anna Y. Hartman.—p. 214.
Why Lumbar Puncture? R. B. Cleveard.—p. 216.
Effect of Penicillin Sodium on Coliform Bacilli and Proteus in Vitro. S. S. Yonemine and F. V. Hartmann.—p. 219.

### Journal of Allergy, St. Louis

19:1-70 (Jan.) 1948

Studies on Correlation Between Symptoms of Ragweed Hay Fever and Titer of Thermostable Antibody. H. L. Alexander, Mary C. Johnson and S. C. Bukantz.—p. 1.
Measurement of Vital Capacity in Asthmatic Subjects Receiving Histamine and Acetyl-Beta-Methyl Choline. Clinical Study. J. J. Curry and F. C. Lowell.—p. 9.
Tissue Changes in Allergy. B. S. Kline.—p. 19.
Chemical Studies on Skin-Reactive Fraction from Short Ragweed Pollen. K. C. Robbins, A. Semeele and H. H. Hasko.—p. 35.
Statistical Studies in Allergy: II. Factorial Analysis. T. G. Andrews.—p. 43.
Aerosol Therapy. G. A. Koelsche.—p. 47.
Spirometric Evaluation of "Ethyl-Nor-Epinephrine" in Bronchial Asthma. L. Levy and J. H. Seabury.—p. 58.
Local Cutaneous Allergy (Arthus Phenomenon) from Epinephrine. A. Rowe Jr. and A. H. Rowe.—p. 62.
Use of Procaine Hydrochloride Intravenously in Treatment of Reactions to Penicillin: Report of 4 Cases. A. E. Cohen and J. Koufman.—p. 68.

### Journal of Investigative Dermatology, Baltimore

10:1-38 (Jan.) 1948

Three Cases of Exudative Chronic Discoid and Lichenoid Dermatosis (Sulzberger and Garbe) (In Shanghai). E. Kocsard.—p. 1.
Correlation of Age and Respiration of Skin From Human Female. Elsie H. Walter and J. C. Aaronbach.—p. 11.
Observations on Eyein Reaction in Sarcoidosis of American Negro. C. T. Nelson.—p. 15.
Studies on Eczematous Sensitization: II. Effect of Engendering of Eczematous Sensitization on Threshold of Reaction to Primary Irritants. J. B. Hoeberlin Jr., R. H. Oliver and A. Rostenberg.—p. 27.
Distribution and Factors Influencing Amount of Sebum on Skin of Forehead. E. O. Butcher and J. P. Parnell.—p. 31.

### Journal of Urology, Baltimore

59:1-112 (Jan.) 1948

Notes on Recurrence in Renal Stone. R. H. LeConte.—p. 1.
*Hypertension in Unilateral Renal Disease. H. S. Sabin.—p. 8.
Method of Uretero-Intestinal Anastomosis: Preliminary Report. R. H. Flocks.—p. 21.
Ureteroduodenal Anastomosis. J. G. Fortner and J. H. Kiefer.—p. 31.
Thrush Infection of Urinary Bladder: Case Report H. R. Sauer and W. R. T. Metzner.—p. 38.
Papillary Carcinoma of Bladder Diverticulum Treated by Transurethral Resection. B. B. Madison.—p. 42.
Diverticulum of Male Urethra: Report of Case. H. J. Hopson Jr. and J. W. Warren Jr.—p. 44.
Ectopic Urethral Orifice Within Urethral Diverticulum: Report of Case. C. L. Willoarth.—p. 47.
Heterotopic Bone Formation Following Suprapubic Prostatectomy. B. S. Aboshouse.—p. 50.
End Results of Injection Treatment of Hydrocele. H. Brushowitz and G. H. Ewell. -p. 67.
Influence of Vasectomy on Incidence of Epididymitis Following Transurethral Prostatectomy. J. H. Lynn and R. M. Nesbit.—p. 72.
*Cancer of Breast in Male, Secondary to Estrogenic Administration: Report of Case. W. Abramson and H. Warshowsky.—p. 76.
Treatment of E. Coli Urinary Infections with Sulfathalidine (Phthalylsulfathiazole). H. S. Everett, G. A. Vosberg and J. M. Davis.—p. 83.
Treatment of Bacillus Coli and Bacillus Proteus Infections of Urinary Tract with New Sulfonamide (NU-445). L. Norins.—p. 92.
*Streptomycin in Genitourinary Infections. C. G. Bandler, P. H. Rees and V. J. Mulcire.—p. 96.
Modification of Brown-Buerger Cystoscope. C. A. Fort.—p. 111.

**Hypertension in Unilateral Renal Disease.**—Sabin shows that there is experimental evidence which indicates that interference with the cir-

culation of one or both kidneys may result in the liberation of a pressor substance into the blood stream with resulting hypertension. This pressor substance has not been demonstrated in the peripheral circulation of human subjects or experimental animals with hypertension. Sabin analyzed 100 cases from the literature in which nephrectomy was performed in unilateral renal disease associated with hypertension and has added one of his own. In 51 of these, the blood pressure returned to normal, although 21 had been followed less than a year since the time of operation. Twenty three showed a reduction in blood pressure but not to normal levels, while in 26 no improvement was obtained. The commonest pathologic condition in these cases was chronic pyelonephritis, the kidneys frequently showing atrophy. The cases of hypertension which may be cured by nephrectomy are comparatively rare. Great care should be exercised in evaluating the functional capacity of both kidneys before operation is contemplated. Compensatory hypertrophy of the healthy kidney is a good indication of a successful outcome. Generally speaking, the younger the patient and the shorter the duration of the hypertension, the better the results.

**Cancer of Male Breast After Treatment with Estrogen.**—Abramson and Warshawsky report the case of a man, aged 51, in whom diagnosis of carcinoma of the prostate with osseous metastases was made. The case was considered terminal and measures for the relief of pain were recommended. He was placed on 1 mg. of diethylstilbestrol daily with much relief of pain and improvement in general well-being. The patient refused to consent to orchiectomy and was discharged March 2, 1944 with the advice that he continue to take diethylstilbestrol, 1 mg. daily, indefinitely. Several months later swelling was noticeable in the mammary region. Subsequently the enlargement of the breast increased. At necropsy the breasts and axillary tissues showed neoplastic growths. Microscopic studies revealed that histologically the tumor of the prostate as well as that of the breast was primary. The metastases in both axillary nodes came from the tumor of the breast. The authors think that there is strong evidence of a causal relationship between the hormonal therapy and the development of cancer of the breast. The total amount of diethylstilbestrol used was 1097 mg. This treatment had extended over a period of four hundred and eighty-nine days. Awareness of the likelihood of the development of cancer of the breast in the male receiving estrogenic therapy for carcinoma of the prostate is important. The changes in the breast incident to such therapy should be carefully observed.

**Streptomycin in Genitourinary Infections.**—Bandler and his associates analyze results obtained in 15 patients with urologic infections in whom streptomycin was used. There have been cases in which streptomycin proved lifesaving after other measures failed. The urine may become sterilized, provided the offending organisms are susceptible to streptomycin. Failure to correct obstructive factors is responsible for the recurrence of infection and may be a factor in the development of bacterial resistance to streptomycin. In the presence of a calculus or of a nephrostomy tube, renal infection may be eliminated temporarily by streptomycin, but unless the obstruction is removed there will soon be a recurrence of the same organisms. In vitro tests of susceptibility of an organism to streptomycin cannot always be relied on to determine its effect in the patient. The immunologic response and resistance of the patient may change the clinical response to the antibiotic. There has been clinical improvement despite the fact that bacteria were still present in urine cultures, indicating that streptomycin may have been effective in altering the pathogenicity of the organisms. In nonspecific prostatitis it is possible to free the prostatic secretions of pathogenic bacteria for brief periods; however, streptomycin does not change the course of this disease entity. The streptomycin presently available has neurotoxic properties. In this series of 15 cases there were 2 cases of toxic labyrinthitis and 1 case of involvement of the left recurrent laryngeal nerve. In a fourth case there was mild and transitory involvement of the facial nerve. In view of the potential toxicity of streptomycin, its prophylactic use in urologic surgery should not be indiscriminate. Since this report was written, the authors have treated many more patients with streptomycin, confirming the impressions and conclusions already stated.

## New York State Journal of Medicine, New York

### 48:113-224 (Jan. 15) 1948

Fatal Hemorrhage Associated with Third Stage of Labor: Study of 60 Maternal Deaths, Brooklyn, 1937-1947. M. Glass and A. M. Rosenthal. --p. 159.
Failures in Glaucoma Operations: Histologic Study. B. F. Payne.--p. 166.
Conservation of Hearing Program in New York State. G. D. Hoople.--p. 169.
Otosclerosis: Its Pathology and Treatment. F. Altmann and D. Woodman.--p. 173.
Treatment of Intrinsic Cancer of Larynx. J. D. Kernan.--p. 178.
Study of Surgical Mastoiditis Occurring in Children at Buffalo Children's Hospital During Years 1945 and 1946. H. E. Boser.--p. 183.
Anteroseptal Infarction. M. A. Donovan.--p. 187.
Preliminary Report on New and Simplified Penicillin Vehicle. M. J. Goodfriend, I. C. Fischer and L. J. Caruso.--p. 192.
Fixed Extension of Knee Due to Capsular Contraction. L. C. Wagner.--p. 194.
Tear of Lateral Ligament of Ankle. L. A. Goldstein.--p. 199.

## Plastic and Reconstructive Surgery, Baltimore

### 3:1-108 (Jan.) 1948. Partial Index

Treatment of Hemangiomas of Head and Neck. F.A. Figi. --p. 1.
Anaphylaxis and Homotransplantation of Skin. D.E. Barker.--p. 34.
Amputation Versus Transposition of Gland and Nipple in Mammaplasty. J.W. Malinac.--p. 37.
Myositis Ossificans of Masseter Muscle: Case Report. J.G. Kostrubala and R.J. Talbot.--p. 52.
Spontaneous Gangrene of Scrotum. Fournier's Gangrene. L.T. Barclay.--p. 56.
Reconstruction of Left Maxilla. H.H. Campbell.--p. 66.
Use of Vitallium Plates to Maintain Function Following Resection of Mandible. B. S. Freeman.--p. 73.
Use of Composite Graft in Reconstructive Surgery of Lower Eyelid. C.J. Armstrong and F.A. Garcia.--p. 79.

## Virginia Medical Monthly, Richmond

### 75:1-54 (Jan.) 1948

Digestive Symptoms Associated with Disorders Located Outside of Digestive Tract. D. H. Barker. -p. 4.
Virginia's New Coroner System. C. H. Irvin. -p. 14.
Management of Gastro-Intestinal Bleeding. G. W. Horsley. -p. 17.
Hopeful Aspects of Cardiovascular Disease. R. E. Gloady. -p. 19.
Rhabdomyosarcoma: Case Report with Response to Roentgen Therapy. S. J. Eisenberg. -p. 27.
Use of Anti-Convulsive Drugs. R. F. Gayle Jr. and T. F. Coates. -p. 29.
Brucellosis (Undulant Fever). G. R. Turoma Jr. -p.32.

## FOREIGN

An asterisk (*) before a title indicates that the article is abstracted below. Single case reports and trials of new drugs are usually omitted.

### British Journal of Tuberculosis, London

41:75-100 (Oct.) 1947

Sequelectomy and Thoracoplasty. A. J. Coello. - p.75.
Chronic Miliary Tuberculosis. V. N. Rogers. - p. 79.
Case of Large Thymic Cyst Successfully Removed From Anterior Mediastinum. J. Smart. - p. 84.
Clinical Aspects of Sarcoidosis. C. Cameron. -p. 88.
*Observations on Sarcoidosis. C. Hoyle. -p. 92.

**Observations on Sarcoidosis.**--Hoyle says that among 135 patients whose clinical features gave some reasons for considering sarcoidosis, the diagnosis could be regarded as endorsed in 16 only by histologic support. Another 14, though probable examples, were unconfirmed, and in 32 others alternative diagnoses seemed just as likely. Of the remaining 73 patients, 53 had chronic miliary tuberculosis. The lungs are among the organs most commonly affected by sarcoidosis. The characteristic form of the disease is a combination of lymph node enlargement, cutaneous lesions and uveoparotitis. In this triad the intrathoracic lymphatic system takes a prominent share, for enlargement of the bronchopulmonary and mediastinal lymph nodes is an early and persistent feature. The miliary type of sarcoidosis shows nothing distinctive of its origin. The shadows conform in size, distribution, density and numbers to the picture of miliary tuberculosis. Both miliary and focal varieties may eventually resemble diffuse fibrotic tuberculosis when the lesions have contracted and scarred. Reviewing observations on tuberculin sensitivity in sarcoidosis, the author shows that two reflections are suggested: that patients with sarcoidosis and a negative Mantoux may not previously have had a positive reaction, and that the disease could still be tuberculous in spite of a persistently negative reaction, belonging then to the deceptive class where tuberculin sensitivity does not develop or is readily suppressed. The author stresses that however the disease is regarded, whether from its clinical appearance and course, its radiology, its morbid histology or its intractability to transmission--the similarity to known examples of tuberculosis is a constantly recurring feature. Although this similarity is no proof of identity, it is so close that separation has become meaningless.

### Monatsschrift für Psychiatrie und Neurologie, Basel

116:129-264 (Sept.-Oct.) 1947. Partial Index

Heredity and Pathohistology of Spastic Spinal Paralysis. I. Farago.—p. 161.
Acute Ependymitis of Lateral Ventricles with Intracranial Increase in Pressure and Hyperkinetic Psychosis. G. Pauloukis and G. Anastasopoulos.—p. 193.
*Diphtheric Polyneuritis in Adults. Z. Bösszörmenyi.—p. 209.

**Diphtheric Polyneuritis in Adults.**—Bösszörmenyi reviews observations on 14 adults, varying in age between 20 and 50 years, in whom there developed paralysis of the cranial nerves from one to five weeks after onset of pharyngeal diphtheria. Accommodation and innervation of the soft palate were most frequently involved. From six to twelve weeks after the onset of diphtheria paresthesias appeared in the extremities, and these were followed by paralytic symptoms in the extremities and sometimes of the trunk. The reflexes were often reduced or abolished. The albumin content of the cerebrospinal fluid was frequently increased. The therapeutic measures included physical therapy, autohemotherapy, administration of vitamin $B_1$, strychnine and liver extracts. In some cases drainage of the cerebrospinal fluid was employed. Most patients recovered within six months. In a married couple the disease took a grave and prolonged course; in one of them a picture resembling Landry's polyradiculitis developed; in the other symptoms of myelitis. In these cases the possibility of superinfection by a virus is considered.

### Riforma Medica, Naples

61:461-478 (Oct. 15) 1947. Partial Index

*Pathogenesis and Therapy of Acute Anterior Poliomyelitis. U. Acqua. -p. 461.

**Pathogenesis and Therapy of Acute Anterior Poliomyelitis.**—Acqua states that there is a relation between poliomyelitis and both gastrointestinal infection and cutaneous allergy. The author carried on research in three different groups of patients. Patients in the first and second groups were seen by the author early in the period of paralysis and during the regression of paralysis. Those in the first group had gastrointestinal disorders in the prodromal period which were absent in those in the second group. Vaccines were prepared with killed cultures of intestinal bacteria and intradermally administered to patients in the first group. Negative results were obtained from vaccines of coli bacillus, whereas vaccines from enterococcus, pyocyaneus and proteus either alone or in association caused an allergic cutaneous reaction and regression of paralysis, which effects were moderate for single vaccines and severe for associated vaccines. Patients in the second group had autovaccines which were prepared from the patients' own nasopharyngeal secretions. Autovaccines failed. However, when they were given in association with vaccines of intestinal bacteria the cutaneous reaction was as strong as that which had been observed in patients in the first group and the regression of paralysis equally well defined. The third group of patients was large. It included patients with paralytic sequels of from ten to fifteen years' duration. Reaction of the skin was definite in these patients, and the return and progressive improvement of muscular function were surprising.

### Wiener klinische Wochenschrift, Vienna

59:805-820 (Dec. 12) 1947. Partial Index

*Employment of Women During Pregnancy. H. Heidler. -p. 805.
Suggestions for Combat of Epidemic Poliomyelitis. F. Kraus. -p. 808.

**Employment of Women During Pregnancy.**--Heidler believes that housework is generally not too much exertion for pregnant women. Shopwork at home does not seem to exert such unfavorable influences as does work in factories, particularly when it involves work on machines. Statistics indicate that prolonged standing is especially harmful. Varicose veins are much more frequent in those whose occupation involves prolonged standing. It is probable that certain toxic substances used in some industries may increase the incidence of premature births or stillbirths. Among such toxic substances the author mentions lead, which is used in toy and ceramic factories and in production of artificial flowers, and mercury, which is used in mirror factories and in the hat and fur industry. Obstetric and puerperal complications are greatly increased among women who work in the textile industry, particularly in those who work while standing. Industrial work also involves disadvantages for lactating women.

# Book Notices

**Modern Treatment of Peptic Ulcer.** By Asher Winkelstein. Cloth. Price, $4. Pp. 205. Oxford University Press, 114 Fifth Ave., New York 11, 1948.

This handy volume presents in detail the extensive experience of the author and his associates at the Mount Sinai Hospital in New York in the treatment of peptic ulcer. The most useful section and one which all internists will welcome describes fully the author's method of treating peptic ulcers by means of a continuous drip of nutritive and alkalinizing solutions into the stomach. The theroetic background for this treatment is ably presented. Present recognition of the fact that most patients with ulcer secrete large volumes of highly acid gastric juice in the empty stomach at night is partly due to the author's pioneer researches in this field and the logic of neutralizing this corrosive fluid by the continuous intragastric drip is appealing. It represents an important extension to the basic concept of Sippy's method. The chapters dealing with the pathologic physiology of the stomach in ulcer and on the pathogenesis of the disease are less complete and valuable. Probably not many will agree with the author's contention that his associates should be largely credited with the present interest in vagotomy. Partial division of the vagus supply to the stomach such as is practiced and described from this clinic and in the older literature has elsewhere been found not to be of much value. The book, however, does not purport to be a surgical treatise and this should not detract from its manifest usefulness as a guide in medical therapy.

**Jonathan Hutchinson: Life and Letters.** By Herbert Hutchinson. With a foreword by J. Johnston Abraham. Cloth. Price, 12s. 6d. Pp. 257, with illustrations. William Heinemann, Medical Books, Ltd., 99 Great Russell St., London W.C.1 1946.

When Jonathan Hutchinson died his medical career was evaluated in obituaries by such distinguished persons as Sir George Newman and Sir Thomas Barlow. Now on the basis of great numbers of letters written to his wife and friends Herbert Hutchinson has prepared a biography which tells the story of this famous Quaker who was stirred by Darwinism and who contributed vastly to medicine and science. His was a great mind a d his biography takes its place among the distinguished works of its type in the field of science.

**A History of Medicine.** By Arturo Castiglioni, M.D., Research Associate in the History of Medicine at Yale University, New Haven, Conn. Translated from the Italian and edited by E. B. Krumbhaar, M.D., Ph.D. Second edition. Cloth. Price, $12.50. Pp. 1253, with 504 illustrations. Alfred A. Knopf, 501 Madison Ave., New York 22, 1947.

The second edition of this important philosophic consideration of the history of medicine is much enlarged over the previous edition. Its approach to the problems of medicine is quite different from Garrison's book. Professor Castiglioni views medicine with a broad outlook in relationship to its position in society. He considers trends and the reasons for their development. In this history various discoveries are considered in proportion to the whole field of medicine and civilization. The history by Castiglioni can be read and is far more than a reference work. It deserves a place in the library of every physician interested in the cultural aspects of medicine.

**De Primaire Atypische Pneumonieen Van Onbekende Oorsprong.** Door Dr. Th. van Erp. (Primary Atypical Pneumonias of Unknown Origin.) Paper. Price, 6 guilders. Pp. 124, with illustrations. E. J. Brill, Ltd., Leiden, Holland, 1947.

This is an excellent monograph composed essentially of a review of the literature on the pneumonias of supposed virus origin, illustrated by appropriate case reports selected from the records of 130 patients studied in a hospital. The patients were chiefly workers in the petroleum industry in Curacao, Netherlands West Indies, and the occurrence of the disease in several hundred persons there after 1943 appeared to be part of the worldwide pandemic of the infection at that time. The subject is dealt with under the usual headings of clinical aspects, complications, roentgenology, clinical pathology, etiology, diagnosis, prognosis and therapy. No controversial points are raised, since the author confirms almost all the previously reported observations. The bibliography contains one hundred and eighty-two references, and credit is carefully given where credit is due.

**Betrachtungen zur Individualpsychologie.** Von Dr. Siegfried Novotny. Paper. Price, $1.20. Pp. 63. Grune & Stratton, Inc., 381 Fourth Ave., New York 16; Wilhelm Maudrich, Spitalgasse 1B, Wien IX/2, 1947.

Dr. Novotny, a senior psychiatrist in the large municipal mental hospital of Vienna, "Am Steinhof," wrote this brief outline of Adlerian theory and therapy in a philosophic vein. For instance, he refers to Kant to explain Adler's concept of conscious versus unconscious. The book centers around the importance of social interest and its limitation through inferiority feelings, which are always self deceptions. The author goes to great length in explaining the mechanism, causes and effects of inferiority feelings. He describes the the three life tasks of work, marriage and social relationships. It is interesting to note that he substitutes Adler's term "style of life" with "Primaeres Leitbild" (primary guiding concept). He gives a good description of the differences between psychoanalysis and individual psychology. The first tries to explain psychic life as a system of conflicting energies, while the latter tries hard to avoid mechanistic concepts; in contrast to psychoanalysis, which is causalistically oriented in describing the effects of various antagonistic instinctual desires, individual psychology sees each person as a unit who can be understood only by his goals.

The importance of courage and the pathologic significance of discouragement are extensively discussed. Neurosis is described as an illusion to conceal anticipated or actual defeat. It serves (1) as a retreat, and for the creation of distance from social living; (2) as illusory satisfaction of the desire for significance; (3) to influence the environment, and (4) to conceal these three tendencies from the patient himself. If the body responds to such tendencies, the ensuing psychosomatic symptoms serve these neurotic purposes. The goal of psychotherapy is to make the patient aware of his goals and of his errors in his self evaluation and to induce him to change his attitudes and concepts. The primary means to this end is encouragement. The author advises letting the patient talk freely in order to find out, first, what the patient really wants. The faulty concepts which have been unknown to the patient must be brought into consciousness, and the more adequate concepts must be so well established that they can sink again into unconsciousness. This means cure.

# Queries and Minor Notes

THE ANSWERS HERE PUBLISHED HAVE BEEN PREPARED BY COMPETENT AUTHORITIES. THEY DO NOT, HOWEVER, REPRESENT THE OPINIONS OF ANY OFFICIAL BODIES UNLESS SPECIFICALLY STATED IN THE REPLY. ANONYMOUS COMMUNICATIONS AND QUERIES ON POSTAL CARDS WILL NOT BE NOTICED. EVERY LETTER MUST CONTAIN THE WRITER'S NAME AND ADDRESS, BUT THESE WILL BE OMITTED ON REQUEST.

## REMOVAL OF WARTS

**To the *Editor*:**—Kindly send me literature or information on the use of liquid oxygen in the removal of moles and warts.

G. L. Hasher, M.D., Hayden, Ariz.

ANSWER.—An article by Irvine and Turnacliff (*Arch. Dermat. & Syph.* 19:270 [Feb.] 1929) has a historical review of the subject, a report of results obtained in various types of lesions and a full discussion by a number of dermatologists. More recently, in June 1947, Kyle and Welsh of Cincinnati read a paper on the subject at the annual meeting of the American Medical Association in Atlantic City, N. J. This has not yet been published but will appear soon in the *Archives of Dermatology and Syphilology*. Both papers report satisfactory results from the use of liquid oxygen on superficial lesions such as warts and keratoses, and both stress the ease with which it is applied. Liquid oxygen, however, is available in relatively few communities.

## ULCERATION OF MOUTH

**To the *Editor*:**—A white woman aged 35, married, a doctor's assistant, has had ulcers in her mouth off and on for two years. Ulcers vary from pinpoint to matchhead in size, are round with grayish white membrane and always start as a small herpes. Usually eight to ten are present at one time, principally on the inner surfaces of the lips, although a few appear on the buccal surfaces of the cheeks. They are extremely painful. During the past two years there was one remission of two months. Gold and silver dental work was performed two years preceding ulcerations in the mouth. She has occasional attacks of hay fever in spring, summer and autumn, but attacks are never severe. In 1941 she had a positive reaction to a skin test for undulant fever. At that time she was running an afternoon temperature of 102 to 103 F. Complete rest in bed for six weeks was prescribed and three ten-day courses of a sulfonamide drug with two-day free intervals were given. Injections were also given at that time, but she has no idea what they were. Undulant fever has not bothered her much since, except that she believes she occasionally runs a slight afternoon temperature. She had a mild attack of urticaria in 1934 and was told that this was caused by eggs and pork. Menses, which started at the age of 13, were seldom regular and occasionally absent for six months at a time; flow was scanty and of only two days' duration. In 1939 the fundus of the uterus and two tumors, or cysts, from one ovary were removed. She had regular sacroiliac manipulation for two years following surgical intervention and has not manipulated since. She has received extensive vitamin therapy and penicillin. The Wassermann test is negative. Ulcers clear up in seven to ten days with or without treatment, only to recur in two or three weeks.

I first saw her in May 1947. The white blood cell count was 11,800, red blood cell count 4,370,000 and hemoglobin 86 per cent. Urinalysis was normal; the basal metabolic rate was plus 2 per cent; gastric analysis revealed free hydrochloric acid, 31 cc. and total acidity 51 cc. Protein sensitich tests elicited slight reaction to a few foods, but her diet was revised without beneficial effect. Administration of "pyribenzamine hydrochloride" (tripelennamine hydrochloride) 50 mg. gave no relief.

The patient states that ulcerations are usually preceded by a swollen axillary lymph node, sore breasts, a feeling of exhaustion and drowsiness.

Suggestions for diagnosis and treatment are requested.

M.D., Missouri.

ANSWER.—A woman aged 35 has had herpes leading to canker sores on her lips and in her mouth for two years, since age 33. The lesions last for seven to ten days at a time and then leave her free for two or three weeks, only to recur again. Once she was free for as long as two months.

Meanwhile she has had mild hay fever and, more important, she has had for six years, since 29 years of age, attacks of fever with temperature up to 103 F. keeping her in bed for six weeks at a time, with sulfonamide drugs administered in courses. The history says nothing concerning the relation between the aphthous stomatitis (canker sores) and the fever or between the stomatitis and the drugs received, and study of the time relations might be helpful.

Undulant fever (brucellosis) has been suspected, especially because skin tests with the Brucella antigen were positive. The patient does not have persistent leukocytosis, although there is evidence of slight anemia. Other chronic infections must be considered. Malaria, rheumatic fever, pyogenic infections, cholecystitis or even endocarditis may cause such symptoms and may be overlooked quite easily.

Herpes and aphthous stomatitis can depend on a local virus infection, but if so they pass off promptly and would hardly recur for two years. Similar lesions can depend on an allergy to foods, but the cases are very rare. In this instance there is no evidence of sensitivity to food either by skin tests or by dietary changes.

Finally, herpes and aphthous stomatitis often occur as complications of acute and chronic infections, and it is possible that the basic lesion here is the infection. Brucellosis alone could cause this clinical picture. On the other hand, allergy to drugs occurs when least expected, and the sulfonamide compounds are particularly prone to produce reactions of this sort.

Treatment is difficult, and when allergy to drugs is suspected the problem becomes even more difficult. Antibiotic agents are not of much value against brucellosis. Penicillin and streptomycin have been tried without success. The sulfonamide drugs have helped in some cases when first used, but later the effect has worn off. General supportive measures are essential; if the diagnosis of brucellosis can be supported, one can consider more active forms of treatment such as vaccines and extracts made from the Brucella organism and its cultures. Unfortunately, treatment of this kind is new and no one knows very much about it. This particular patient will need much further study before an accurate diagnosis can be made and proper therapy applied.

## "DICUMAROL" AND PROTHROMBIN

**To the *Editor*:**—After I had abnormal bleeding in patients treated with "dicumarol" who apparently had fairly good prothrombin levels (40 per cent of normal), I investigated the laboratory methods used and the method of calculation of percentage of prothrombin. I found two entirely different methods of calculation, neither of which is correlated with the other. The method most widely used is to divide the normal time in seconds by the abnormal. This figure is reported in percentage of normal. This method is described in several textbooks and is the method advocated by the manufacturers of thromboplastin. The arithmetic used in this method is in error and no correlation exists between this method and that advocated by Allen and associates, which is: dilute normal plasma to 10 per cent, 20 per cent, 30 per cent, etc., and compare the time with the unknown.

At the Good Samaritan Hospital in Cincinnati, we calculated percentage according to both technics with the startling results:

| Percentage as Calculated by Allen's Method | Time in Seconds | Method in General Use (a/u × 100) |
|---|---|---|
| 10% | 60 to 70 | 25% |
| 20% | 30 to 45 | 50% |
| 30% | 20 to 22 | 75% |
| 40% | 17 to 20 | 80% |

No correlation between the two sets of figures occurs. If Allen's method of prescribing "dicumarol" is used with the alternate method of reporting prothrombin percentage quite disastrous results may be expected. I found this to be true on interrogating the local physicians and members of hospital staffs. Laboratories almost universally were reporting in the percentage of normal (a/u × 100) and physicians just as universally were prescribing according to Allen's technic, with some unhappy results.

I have found almost every one, both in clinical practice and in the laboratory, unaware of this discrepancy until it was pointed out to them. With a drug as powerful as "dicumarol" there is no place for uncertainty or inaccuracy in the laboratory technic, the calculations or the method of reporting. It might be wise to discard percentage reports entirely and to report in seconds, with the normal also given in seconds. If percentage reports are to be retained, the method for determining percentage should be standardized.

D. C. Rivers, M.D., Cincinnati.

ANSWER.—A safe and accurate way to express prothrombin activity is as per cent of normal. This value can be calculated fairly accurately by the equation: $C = \frac{k}{p.t. - s}$ ($c$ = concentration or prothrombin activity as per cent of normal; p.t. = prothrombin time; k and a are constants which have a value of 303 and 8.7 respectively, provided 12 seconds is obtained for normal plasma). To calculate prothrombin per cent by dividing the normal by the abnormal prothrombin time is entirely erroneous.

The present confusion will not be remedied until a standard procedure is adopted. The most reliable course would be to follow the directions as outlined by Quick (*Am. J. Clin. Path.* 18:560 [Dec.] 1945). Various modifications, particularly the bedside method, the diluted plasma method and other procedures using thromboplastins of dubious activity had best be entirely discarded. Rabbit brain dehydrated with acetone furnishes the most satisfactory source of thromboplastin, because if properly prepared it has a high and consistent activity and deteriorates slowly. If a prothrombin time of more than 13 seconds is obtained on normal plasma, it is best that a prothrombin time be also run on 50 per cent and 20 per cent plasma (i. e. normal plasma diluted with one and four parts of isotonic sodium chloride solution, respectively) and reported with the unknown. For effective "dicumarol" action the prothrombin time should be reduced to the 20 per cent level, i. e. to the prothrombin time of 20 per cent plasma.